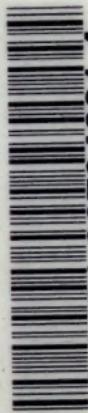


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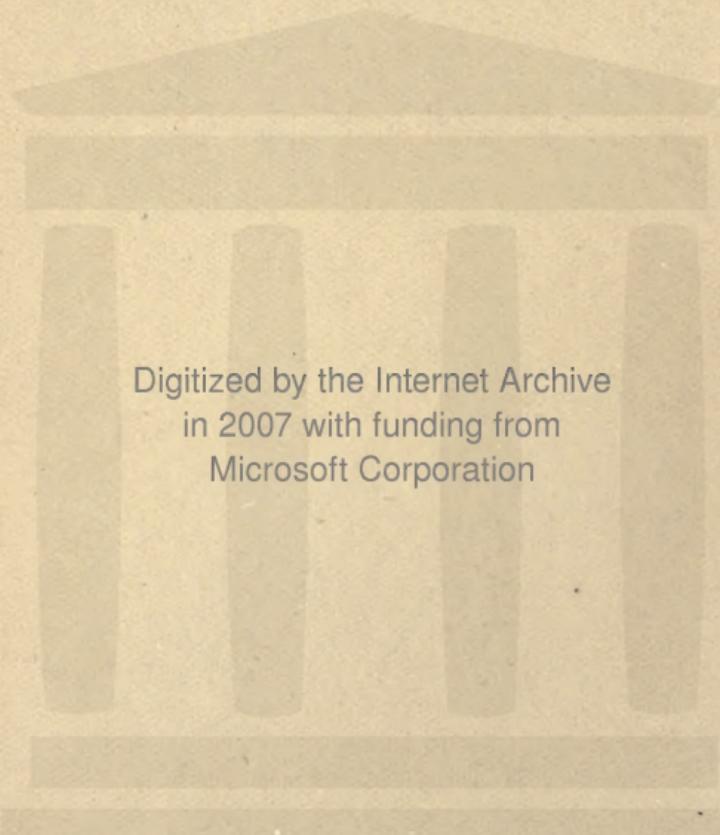
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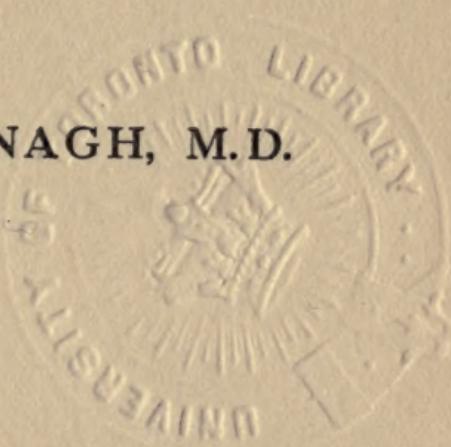
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# THE CARE OF THE BODY

BY

FRANCIS CAVANAGH, M.D.



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# THE CARE OF THE BODY

## CHAPTER I

### SLEEP

WE spend the greater part of our lives in sleep ; it is the great restorer ; it is therefore fitting that we should first consider sleep.

Sleep, to be refreshing, must be dreamless : on awaking there should be no memory of the hours of sleep, but only the pleasant consciousness of life.

Man waxes and wanes, his heart beats and rests, his brain works and must sleep. The proximate cause is fatigue, not day or night, nor the succession of the tides, nor the influence of the moon. Simply fatigue. It is a resting stage. It may be traced through the higher animals and birds, to reptiles, insects, the crustacea, and even the bacilli.

Sleep is a time for rebuilding those cells which have been engaged in the operations of consciousness and which have been worn out during the hours of activity.

The order in which the faculties become blunted by weariness is the reverse order to that in which they have developed. This is the Law of Dissolution, and is well evidenced by the effect of alcohol, and in fact of most poisons, upon the brain. Attention and judgment first disappear, then memory, imagina-

tion, and speech ; while the eyelids droop, and the head tends to fall forward. It is evident that but for the higher faculties the need of sleep would be much less, and in fact there are realms of the body which one would at first imagine do not sleep. The movements of the stomach and bowels, though lessened, do not cease in sleep. The heart beats faithfully by night as well as day, and we never fail to breathe no matter how deep the slumber.

There is a difference, however. The activity of these lower systems, including that of their nerves, takes place in waves ; and the intervals are sufficient to provide the necessary rest. Between beats the heart and its nerves are rebuilt to the extent which the beat makes necessary. Otherwise there would be heart failure. Even the waking eye has its periods of rest—those twentieths of a second when it is covered by the winking lid. Attention and judgment are, however, in the ordinary citizen's waking day never asleep save when he himself is. For while he is awake he is seeing, hearing, and thinking.

It must be noted that, even in hard bodily labour, where the higher nervous centres seem to be completely out of action, fatigue is dependent upon the brain and not upon the muscles. The proof is simple. Place a finger in a loop of string running over a pulley, with a small weight attached to its lower end. The name of this little apparatus is 'the ergograph.' Move the finger (the wrist and arm being held steady) so that the weight rises and falls ; and perform this movement till it becomes impossible from fatigue ; yet the application of appropriate electrical

currents to the muscles or the nerves of the finger will cause that finger to contract actively. The fatigue then is due to neither the muscle itself nor to the nerves controlling it. By further elimination it is found that the failure takes place in the cells of the brain. The brain cells become bathed in the waste products of activity: the result is the brain cells protest and demand rest.

A period of reconstruction is essential to brain cells; its duration must be judged by their needs; and no rest is sufficient which does not ensure their complete reintegration.

The material basis of morals, mind, and soul exists in the cells of the brain, which number anything from six hundred millions to two thousand millions, or approximately the number of the people of the earth. They vary in shape and function, but have the same physical needs—food and water. In fatigue their food stores diminish and they shrink considerably in size. The renewal of these stores is the function of sleep; and that such renewal may occur the ordinary supply of arterial blood to the brain must be varied. The red cells contained in this blood throughout the day carry to the cells repeated supplies of oxygen wherewith to burn up the food stores of the cells and create energy. In sleep there is a succeeding state of anaemia or partial bloodlessness of the brain wherein the removal of waste and the accumulation of stores from the lymph stream.

How this anaemia of the brain is secured is still in dispute, but, in the flushing of the skin which accompanies all healthy repose, one of the mechanical devices towards this end is visible to every one. The

amount of blood in the body being constant, the dilatation of the blood-vessels in the skin is bound to drain largely all other parts, including the brain. At the moment of dropping off to sleep there is an instant pallor of the brain surface, while at the moment of awaking the reverse occurs. Flushing of any part of its surface during sleep indicates a destructive activity at that part, and an almost certain amount of dreaming, the kind of which will depend upon the special area.

Let any one go to bed with a heavy, undigested supper, who has been worrying over business or any other futility during the day. Then instead of an equable set of automatic stimuli passing to the brain and producing a condition of organic well-being, there will be an eruption of urgent messages from stomach and intestines. The messages sent from the disgusted organs are powerful, and may be violent enough to wake the sleeper. But if they fail in this they wander into the easiest brain channels that are open to them ; find that certain cells, those that have been worried during the day, are still somewhat on the alert : there is a prompt fusion of grievances, and the result is a well-deserved nightmare in which the cashier has absconded with all one's worldly goods —and other equally cheerful happenings. The sufferer wakes in a cold sweat and imagines he is sleepless on account of his worry. And of such stuff are dreams made. They are storms set up by irresponsible or disorderly stimuli.

Whisper in a sleeper's ear and it may be possible to dictate his dream. Prick or irritate the skin, and again he may dream. So also from any part

of the body it is possible to communicate with the sleeping brain and to 'suggest' to it.

The means by which the Pathan hill thief gets the coveted rifle without the dangerous necessity of cutting a throat depend upon the same conditions. The Pathan crouches by the side of the soldier sleeping upon his rifle : he gently tickles certain areas of the soldier's skin till movement of the body shows that the message has reached the brain : by graduating the tickling or skin stimulation till those movements have been made which disengage the rifle from the pressure of the body, the robber secures his booty.

Similarly we may explain somnambulism, in which, responding to some outer stimulus, the sleeper may walk, talk, even see and hear, as well as act. All are due to a hyperæmia of portions of the brain, insufficient to awaken full consciousness but sufficient to produce a certain amount of activity.

Anæmia of the brain is needful for brain-rest. Hyperæmia of the brain is the condition to which an unwise generation endeavours to condemn us. Even Dr. Oliver Wendell Holmes, who might have known better, sings the praises of those 'bulbous-headed' individuals, who, while studying, need to keep the feet in hot water on account of their liability to become cold ! If, by over-exertion, any one persists in maintaining a state of literal 'redheadedness,' in which the rest of the body cannot at the required moment (bed-time) drain off the superfluous blood, then that person must dream or suffer from insomnia, or both, and is in a fair way towards a serious breakdown.

Muscular action has limits set to it by the state of fatigue caused in brain cells, but the check to brain activity itself is by no means so efficacious. There is yet another contrivance for safety in voluntary muscular action, since, if this is persisted in too long, the brain is shut off from actual concern in it, and the movements become practically reflex or mechanical. Only thus can be explained those extraordinary club-swinging feats in which the action has been maintained for twelve hours without cessation. In similar fashion battles have been fought by dead-tired men who have had little after-recollection of what happened. There is, however, no mechanism for thinking reflexly to the best advantage: though a near approach to it is made in that process which is known as 'sleeping over a question.' Sleep is therefore the touchstone of good health. If it be deep, dreamless, and refreshing there can be little amiss with the controlling mechanism of the body.

Sleeplessness is one of the terrors of modern city life. Many conditions may induce it, or its twin sister, the dream state. Too great a strain, too little work, cold, heat, a draughty room, a stuffy room, a cramped position, faults in the bed, the pillow, or the bed-clothes, emotion, heart disease, high blood pressure, low blood pressure, too much tea or the lack of tea—and innumerable other causes. According to Broadbent, the commonest cause of all is dyspepsia. Late meals may be quite sufficient to account for distressing nightmare or actual sleeplessness. But that is easily remedied: let the last good meal be taken three hours before bed is reached, so that the heavy work of digestion may be performed before

the lessened activities of the organs of digestion can materially interfere with it, and there is little likelihood of any gastric catastrophe disturbing rest.

The predominance of things seen must have been noted by every one who has dreamed: an indication at once of the area in which lies the chief trouble. For if visions are the principal components of any dream, it is evident that those cells which have been concerned in seeing are still active. It is a condition, in fact, of too vigorous a blood supply to these parts, indicating that they have been over-used. It by no means follows that the initial stimulus which led to the dreaming came from the eyes. These are well protected in slumber, since the pupil is contracted, the eye well turned up under the lid, and the eyelids closed. But it is a fact that if any part of the brain has been too greatly exercised the resistance of this part to disturbance is lowered, and stimuli which in ordinary course would have taken quite a different direction are readily diverted to it. A nerve impulse coming from the heart, a cold foot, or a cramped muscle may arrive in the easily accessible channels of overdone visual activity, and result in the calling forth of images. This process has almost limitless possibilities through the contents of the visual cells of all the images of the past: a twenty-year-old visual memory may find itself linked with the scene of yesterday: there is neither time nor space in dreamland. The visual cells, then, which most of all are worked and which are most in need of rest, are the very cells which are least likely to obtain this.

It is, in fact, justifiable to conclude that, where no

special form of brain activity has been overtaxed, and where the visual areas are as normal as the others, no stimuli arriving from the organs of the body are likely to cause dreaming. This may explain the apparent anomaly of the labourer who can eat a huge meal, drink a quart or two of beer, and yet sleep immediately thereafter with the sublimest of content and satisfaction.

To go to bed with the brain acutely interested is clearly a mistake. Professor Chiene's advice to his students was to put in half an hour at least after working, over a novel of just sufficient interest to keep the attention without engrossing it.

This matter of dreaming, considered chiefly as a phenomenon of visual memories and images, bears directly upon the question of hallucinations, visions, ghosts, and their various allies.

If the reader has ever suffered from any long illness and had the misfortune to be confined in a room the walls of which were covered with a patterned wallpaper, the dancing shapes which its maddening lines have assumed in his sick fancies have taught him all there is to know about hallucinations. We have at our hand conclusive proof of how all such apparitions can occur. We know that a number of brain cells are concerned in the operations of vision and visual memory : we also know that these cells are the most likely to suffer from over-work and from want of rest, and that, in this state, they are peculiarly liable to attract to themselves nerve impulses arising almost anywhere in the body, with the result that things are apparently 'seen.' If there is also some slight defect of the eye mechanism itself, in fact bad

eyesight, then there exists in such a combination an almost irresistible tendency to see ghosts.

It may not be irrelevant to point out the kinship of the results obtained in dreaming, the visions of over-strained eyes and insomnia, the hallucinations of emotionalism and the actual hallucinations of the insane—in whom also the visual predominates.

The insomnia of an individual suffering from too high a blood pressure, or from the opposite condition of the neurasthenic, in whom the pressure is too low, is rather a symptom of disease, but the simple devices of purging in the former and a cup of tea in the latter are frequently so effectual that they may be mentioned.

### *Duration and Time of Sleep*

The healthy new-born child, which has slept continuously, and thrived, for nine months before birth, carries on the sleeping habit for several months thereafter, and, save when taking its meals, sleeps all the time. With increasing age the amount required diminishes till, when seven years old, half the day suffices for rest, and, at eighteen, nine hours only is required. The adult may, if he is a good subject, lessen this by an hour, while old people may be amply satisfied with seven, six, or even five hours at a stretch. Twenty years ago the *Encyclopædia Britannica* declared seven or eight to be the allowance for an adult, but to-day the tendency is all in favour of adding another hour.

There is a consensus of medical opinion that the allowance of sleep has recently been too little,

particularly in the case of school-boys, and that no growing lad should have less than nine hours. Along with this has also occurred a denial of the fetish of early rising, unless accompanied by early retiring. Sir George Darwin advises us to forfeit some hours in school rather than some hours of sleep. Acland accuses irrational early rising of being the cause of nervous breakdown, strain, insomnia, chorea, and epilepsy, and emphasizes particularly the truth that physical exercise is no compensation for want of sleep ; it is, in fact, an admirable illustration of lighting the candle at the lower end to make up for burning at the upper. Bevan Lewis attacks also the dangerous assumption that change of occupation means relief to fatigue, since fatigue anywhere floods every area of the body, including the brain, while sleep means relaxation everywhere. And to connect more directly, as has already been suggested, the matters of too little sleep and insanity, Lewis declares that the dangerous variety, adolescent insanity, is most likely to occur in neurotic individuals having inadequate rest and sleep, and that in such cases ten hours' sleep is not too much. The characteristic of normal sleep is that it is deepest in the first hour and gradually shades off to the time of awaking ; while in neurotic sleep the first hour or so is deep, then comes a long shallow period, and later, towards the hour of rising, again a deep period. The value to memory of every additional hour of sleep has been thoroughly proved by German investigators.

The intensity of sleep is measured by the loudness of sound needed to awaken the sleeper, but the light sleeper is quite as normal as the deep. We are on

the safe side if we declare that every man, as an average, requires at least eight hours, and every woman nine. The difference between the two is explicable by the difference in sex and the function of each, man being catabolic or destructive, while to woman is relegated the greater share in construction or anabolism. We may remember that there are recurrent periods of greater outflow of energy in the case of woman when rest requires lengthening, and periods of fewer occurrence when, from a double work of construction, rest should again be increased. And at such times every woman should be debarred from the work of a labourer, as Dr. Newman has convincingly shown.

At puberty, adolescence, and all climacterics there is especial need of attention to securing a sufficiency of sleep. Boys or girls should never be allowed to 'sit up late,' even—or rather, most especially not—for dances. Regularity in time and duration of sleep is essential to the growing organism.

Lord Kitchener, it is said, can sleep at any moment: so can most doctors with busy practices, and snatches of sleep are always better than none. Napoleon is quoted as finding five hours ample: it is significant, however, that Napoleon was an epileptic. Certain hysterical subjects have slumbered for from four to ten days; and in the other direction there is record of a famous bout of card-play which lasted ninety hours. Sleep is the period of growth: the baby is growing and multiplying everywhere, hence its need, and, in a minor degree, that of every child. The adult has to replace what he has used in work and thought, but the old have established in their earlier

life every cerebral path which is of use to them, and their bodily exercise is strictly curtailed: their life is in using the work of the past, and their thought is strictly limited to the paths they have already laid.

The maximum for safety cannot be laid down. Terrific and prolonged exertions have resulted in healthy sleep persisting for twenty-four or even thirty-six hours; and there are cases of even four and as much as ten days' sleep on the part of hysterics. There is little risk, however, of the ordinary citizen getting too much, though one or two physicians believe that actual harm may result from excess.

There is no absolute reason why we should not imitate the life of the night-watchman and sleep all day. The terrestrial revolutions exert no coercive influence, though indubitably the darkness and the lessened noises of modern life during the night are of importance. The 'eight till two' of the Trappists is valuable, if not for its duration, at least in its time of commencement, and a suggestion for phthisical patients has been based upon this, since in the early morning the air is at its purest. The habit of continuous sleep is peculiar to modern man, and is probably derived from his sense of security.

There is, however, sound science at the basis of the old belief in 'beauty-sleep' and the value of the hours before twelve at night so spent. From one to three a.m., according to Professor Wyllie, 'the vital tides are at their ebb.' It is well to prepare the body for these fateful hours, and there can be no better preparation than the reconstruction obtained by several hours of sleep. Hence the reasonable hour of going

to bed is ten, or at latest eleven. The attractions of the 'wee short 'oor ayont the twal' are various and many; but Burns died at the age of thirty-seven.

The best time for the ordinary man or woman to sleep is from ten to seven. There are people who have worked part of an hour and slept the rest of the hour, and kept this up for weeks. That attempt by the curiously named Tony Todd, to walk two thousand miles or so in one thousand hours, is a striking example. There seems no reason, apart from habit, why we should not divide our work and rest similarly, say by working thirty-five to forty minutes and sleeping the remainder of each hour. That this is possible has been proved. But since most work has to be done 'in the lump,' so to speak, rest must be arranged similarly. We may notice that the heart works on the 'Tony Todd' system of short working times with short resting intervals.

### *The Bedroom*

Many vigorous men have never slept with their bedroom window open. Hundreds of students will remember their 'bed-closet,' a tiny cubby-hole without light, and often without ventilation, in Edinburgh and Glasgow lodgings. Similarly, one may point to the household cat or dog—sanitation not yet having expelled these from the home—and observe its nose and mouth buried deep in its fur or hair. And many a man in his attempts to sleep has finally buried his head deeply beneath the bedclothes, and sometimes at last attained the required rest by this procedure.

But neither man nor dog nor cat long preserves

this attitude of semi-asphyxiation. Convulsive movements promoted by too much carbonic acid in the blood soon liberate the man's head from the clothes ; and in the animal, a movement of only an inch or so is sufficient to clear the nostrils. So, while this manœuvre may be regarded as a method of wooing sleep, it cannot be held that the whole of sleep should be spent in the same fashion.

Why, then, the open window and the need of ventilation, which apparently should retard sleep by keeping up too steady a supply of that oxygen which it is the chief concern of the body to limit in reaching the brain ? It is not the primary object of ventilation, however, to renew the oxygen of the room. Nor is it to clear out immense accumulations of carbonic acid, for never does this reach to anywhere near the danger-point. The object aimed at in the constant change of air is to eliminate certain organic impurities exhaled from the sleeper, which indeed are poisons ; and further, to attack various organisms, particularly the bacillus of tuberculosis, which are unable to flourish in pure air. The carbonic acid of an inhabited room serves as an indication of the amount of organic impurity that accompanies it, the proportion of the one suggesting the proportion of the other, which is less easily directly measurable.

One thousand cubic feet of air is proper for any sleeper, and this requires to be changed every twenty minutes : more frequent changing can do no harm, but would render it difficult to avoid draughts, and draughts should be avoided in sleeping-rooms lest the warmed surface of the body be chilled too rapidly. There must be a window open top and

bottom, entrance and exit being thus secured even in the lack of a fireplace. The device of a lower sash which projects higher than the lower edge of the upper, or of the sash raised by several inches of board so that an interval between lower and upper sashes is secured, is valuable. The air of the bedroom must approximate as closely as may be to the outer air.

Night air is night air whether in or outside the room ; and air at any time in England is harmful only by reason of what man has added to it. Chimneys, furnaces, and fires are less active during the night ; the streets are not so tormented to dust, so that the advantage lies on the side of the night. Neither are there subtle dangers in the light of the moon or stars ! Better the closed window, however, than the air of some cities where fatuous corporations sweep dry streets with machine brushes and raise the din of pandemonium.

Blinds to exclude the light must vary with cases, since some could not get sufficient sleep, in summer at any rate, without them, though the ordinary mechanism by which normal waking is ensured is the gradual increase of light. There need be no hesitation, however, in condemning curtains. The rational bedroom will contain neither extra furniture, hangings, carpets, rugs, pictures, nor ornaments ; especially the space beneath the bed will not be utilized as a lumber-cupboard. Valances must go with the rubbish. No sink or water-closet should be in the room. The walls and ceiling (*why* should a bedroom ceiling be white ?) if papered must be washable and frequently washed—a favour usually

accorded for some occult reason to only the floor—and of a cool blue or grey colour. Dirt must find no favour or gathering-place. A stuffy bedroom is simply a dirty bedroom. Curtains round a bed or bed-head are anathema ; draughts must be avoided otherwise than by these.

If at all possible the bedroom should be the sunniest and best room in the house, i.e. in England. Few people spend as much of their lives in any other room, and tubercle bacilli die after a few minutes' exposure to sunlight : *verb. sap.* The ideal bedroom would be oval or rounded, with no single angular joint anywhere, even where floor and ceiling meet the walls. In even the best-ventilated rooms the air in the depths of corners is sluggish and changed only by gradual diffusion : and in such corners organic matter and its faithful attendant bacilli are bound to congregate. No gas must be left burning during the night, and if warmth alone is required it can be obtained from electric radiators, although a good fire in the ordinary grate will secure this as well as assist ventilation. Gas stoves are not desirable.

The proper place of the bed is in the middle of the room : certainly not against a wall, which by such an arrangement receives far more than its fair share of contamination. The floor on which it stands is best of polished wood.

Of polished wood or metal, also, will be the bed itself, which ought to be single. One thousand clear cubic feet of space are required for each sleeper, but no advantage is gained by having any ordinary room more than twelve feet in height. The ordinary hair mattress, based upon the usual spring foundation,

forms an excellent material for rest, and to correct the inequalities of the mattress and to add to the comfort a blanket, covered by an absorbent sheet, completes the foundation upon which one can best repose. Sheets should be absorbent, which the ordinary cotton or linen articles are not. The bedclothes must be adjudged by the needs of the sleeper, so long as they are the lightest possible consistent with warmth. All bed materials ought to be framed on the same principles as guide us in the choice of ordinary clothes, viz. warmth, lightness, and ventilation. Feather beds, flock or wool, are not desirable. They are more difficult to persuade to levelness and are usually more or less insanitary—dirty. It was estimated only recently that certain flock beddings contain more bacilli than are present in sewage!

Every tall man knows the acute discomfort of too short a bed. As regards width, that is correct which will take most of the weight of the bedclothes off the sleeper, and yet permit of ventilation by his movements. Fixing the clothes at the foot of the bed is a necessity for comfort, but in England it is seldom essential that these should also be tucked in at the side to form an absolute sleeping-bag.

The usual practice is for the bedclothes to be thrown back by the sleeper when he rises, and for the bed to be made as soon as possible thereafter. That is ridiculous. The time to 'make' a bed is immediately before it is required, and the time to 'air' it is the whole of the rest of the day.

The methods of wooing slumber are innumerable. Some are quaint, as, for instance, that which supposes the head to be a storage battery of electricity, from

which the excess, which is maintaining the wakefulness, may be drained by putting the hand to the head, the hand acting thus as a conductor. There is much in the value of faith (whose medical name now is 'suggestion'), and Dr. Schofield tells of people who find it sufficient to place sulphonal or some other hypnotic by the bedside, its mere presence inducing sleep! There are those who pin their faith to counting mentally an innumerable succession of sheep jumping one after the other over a hedge. What is aimed at in all is to produce that state of brain anaemia, with slower heart-beat and respirations, general muscular relaxation and skin warmth which distinguish sleep. Deliberate relaxation of all the muscles, noting especially those of the face, with an attempt to imitate the rhythm of the breathing of sleep, is occasionally of assistance.

Brain over-work, too strenuous a use of the eyes, or too late supper, suggest their own cure. If the skin is cold the best remedy is a warm bath, or if that is not attainable, warm sponging.

The warm bath before bed is one of the best modes of inducing quiet sleep. It dilates the skin vessels which play so important a part in healthy sleep, soothes an immense number of cutaneous nerves, and helps greatly to produce the sense of organic well-being so necessary for healthy sleep. Even emotion, that prolific cause of sleeplessness, is soothed by the bath, which forms a fitting close to a last half-hour of the day spent in quiet meditation.

An occasional contributor to disturbed rest is faulty position. The head may be too low or too high. Sleep on the right side or the left is, or ought

to be, merely a matter of habit, for sleep should be equally easy on either. When it is not so, this may be due to slight errors of digestion, and in such cases lying on the right side is most likely to secure repose. Sleeping on the back is not usually successful, as is readily understood from the position of the great ganglia and nerves, which will be most pressed upon by the stomach and viscera falling back upon them. But whatever the position, that is best in which sleep is best, and that fallacy need not be heeded which says that curling up in bed, for instance, will lead to deformity.

Drugs I have no intention of recommending. For this purpose they are as truly edged tools.

It is worth noting in these days when food and diets are so greatly discussed that a good sleeper needs less food than his restless neighbour. ‘He eats, who sleeps.’

## CHAPTER II

### BATHS

THE function of the matutinal cold bath is in the least degree that of a bath: the feature which commends itself to the user, commander, and bigoted proselytizer, is its coldness: the water is merely the accidentally convenient medium for applying cold. This differentiates it from every other, since the main purpose of baths depends upon the water and is summed up in the word 'cleanliness.' There is little fear that any one will argue for cold water as a cleanser.

Let it be granted that it is well to apply water to the whole body as soon as possible after rising in the morning, and also that the colder the application that can be endured with benefit, the more vigorous is the health of that fortunate individual likely to be. By this test—benefit—must the cold bath be judged for each person. There are people in whom the desired reaction and delightful afterglow can only be obtained by preceding it with a warm bath, and there are others in whom the cold produces nothing but harm.

In suitable cases the activity of every organ in the body is stimulated, and whereas the initial cold dip was only a matter of a minute or so, the reaction may persist for several hours. That is what should occur,

but if it does not there is no immediate reason for deciding that the treatment is unsuitable. The common mistake is in the length of time spent in the water. Shorten this and assist the reaction by vigorous towelling, before rejecting finally what is in reality an extremely valuable stimulant to those for whom it can be made suitable. If this fail, it is well to consider whether the temperature of the water selected is not too low. By beginning with a temperature only just below that of the body, and lowering it a degree or so every morning, there are many who can arrive at that of cold water with ultimate benefit. Or by a preliminary warm bath, and with similar care in the graduation of the coldness of the after douche or dip, the desired hardening may come.

The man who in defiance of nature persists in his cold bath, though ten minutes after he is still shivering with chattering teeth and livid lips, nose, and ears, is, in blunt Anglo-Saxon, an ass. In general, the value of a cold bath is in inverse proportion to its length.

The bath of cleansing, the warm wash, the brisk rub of the rough towel, has other aims. It stimulates the natural action of the skin. The skin surface is covered with minute glands internally connected with the nerves and blood-vessels. The output of these glands is sweat or perspiration. The water of perspiration is valuable on account of the readily equable temperature that can be maintained by its evaporation. There is also an oily element derived from the sweat glands which is considered to have the chief lubricating function for the skin ; and in such places as the palms, where there are no other

oil-secreting glands, there is yet ample lubrication by this secretion.

The amount of perspiration is in no degree measurable by what is actually seen. The evaporation of water from the surface of the body is constant and takes place chiefly from the mouths of these sweat glands. The total amount so changed during the twenty-four hours from the skin of a healthy man is probably about fifty ounces, and as the specific gravity of the liquid is 1004, the total solids can evidently be only one-fifth of an ounce, these containing traces of urea and proteids, sodium chloride and other salts, fat and fatty acids.

The little channels by which the sweat is carried through the skin are corkscrew in shape, which must render it more difficult for noxious matters on the surface to enter their open mouths—and the constant and considerable flow of sweat will act in the same way. It is, in fact, not by the sweat glands usually that the skin is liable to infection: and the skin generally being protected by horny *keratin*, is equally well guarded. The normal skin cannot absorb water or anything contained in the water. Though iodine, guiacol, turpentine, and other materials can be shown to enter the body after mere skin applications, they do so by destroying part of the horny layer and so breaking down the natural guard. The electric bath is, however, efficacious at its positive pole in obtaining the desired ingress of medicaments. But even mercury vapour baths cannot carry the metal through the outer layers, and their effect depends upon inhalation by the lungs. The assailable spots—as is evidenced by every boy who is suffering from acne, or

'pimples'—are the openings of the little glands which secrete fat at or beside the point of exit of the hairs.

There is a pathetic story of a little child which, to dignify an ancient Papal procession, was gilded all over, and otherwise decorated in harmony with the taste of that time, to represent a little angel: as a result of which gilding it is said that the child died—the idea being that by complete suppression of the sweat he was poisoned.

The skin must not lose heat too rapidly. Liebermeister has estimated that the heat loss from the body immersed in water at 86° Fahrenheit is double the normal; at 77 three times; and at 68 five times: what it will be in ice-water the enthusiast interested may estimate for himself.

In the grease or 'sebaceous' glands of the skin associated with the hair there exist an infinite number of vulnerable points; and most of the processes of cleanliness are unconsciously directed to their protection. It is well known that the vigorous application of ointment to the skin will cause the drug in the ointment to be absorbed. Similarly, if on any part of the skin there exists a group of bacilli, and at this same point there is a collection of unremoved 'sebum,' there is produced a most undesirable ointment. Add to this the constant friction of clothes and the last essential for skin absorption is supplied. It is then undesirable to allow the settling down of organisms, the dirt containing them, or the sebum which affords them such an admirable nidus. Dust or dirt modern man cannot avoid, nor can he prevent the secretion of sebum, but the re-

moval of accumulations he can ensure ; which means a daily cleansing bath.

Friction alone will remove, though it may also rub in. Cold water, tending as it does to the firmer coagulation of these fatty materials, is far from satisfactory, so that the value of the warm bath is evident ; and if the proper time of the cold dip, as indicated by its effects, is the commencement, then as surely the best time for cleansing will be at the end of the day.

Certain foolish people take their bath so hot that it actually threatens them with heart failure. The hot bath retards all bodily processes, so that it must not be taken immediately after a meal. It is, however, extraordinarily effectual in relieving spasm of muscle or cramp, whether of the limbs, in which the muscles are voluntary, or in colics of any kind, where the disability is on the part of involuntary muscle, as in the bowels, heart, or stomach. From this effect of soothing heat are derived the advantages for such seizures of hot fomentations and poultices.

On account of the profuse perspiration that is induced by the effect of the heat on the nerves of the skin, it will evidently be well to follow up the hot bath by an immediate retirement to bed. Such a bath, which itself produces anaemia of all the internal organs, and especially the brain, must clearly tend to the production of sleep.

Sponges become very soon extremely dirty, a large part of the bacterial debris from the skin, as well as collections of soap, becoming almost inseparable from the substance. For those, however, who would not take kindly to washing without some assisting appliance, a better article is a loofah, which

can be thoroughly beaten out afterwards ; but the best of all is a piece of rough towel, which can be boiled or thrown away after use. Rubbing, in the case of the hot bath, is an essential part of the process : here it differs from the cold bath, in which the benefit is actually derived from the chill impact, though reaction may need to be promoted by friction.

Under these two main classifications of hot and cold may be grouped innumerable variants of baths.

The cold douche, like the hot, is similar in effect to the plunge ; the choice is mostly determined by convenience. 'Indifferent' baths or douches in which heat is neither added to nor taken away from the body, are valuable for sensitive subjects, and act usefully as sedatives on muscles and skin nerves : they are therefore distinctly beneficial.

The shower, the needle, the Scotch, and other douches depend upon the distinctions that have already been made clear regarding the effects of cold and heat, and in the best results are tonic and invigorating. What has been said regarding the cold bath will *a fortiori* apply to the cold shower, or to the needle douche, or to the so-called Scotch method, in which alternating hot and cold sprays are directly and vigorously darted at the body. These are refinements for those who care to amuse themselves, and are not necessary in the preservation of ordinary health. But this much may be said in favour of the shower ; its effects are shorter and crisper than any other form of cold bath, and experience shows that the loss of heat is less and the reaction more speedy. The shower may be happily enjoyed when the cold plunge cannot be endured.

Turkish and vapour baths, however, are regarded by some as almost essentials. The fact of interest in the Turkish bath is that by means of it a temperature immensely higher than that which could be borne in hot water can be sustained by the body in the hot air without disaster, and indeed with benefit if ordinary care is taken. The beginner will find 130-140° F. quite high enough to make a start on, and will not linger unduly in even this. The effects are those of heat simply: the internal anaemia and the skin flushing, profuse perspiration and general lethargic sense of well-being. This must be followed by the properly graduated cooling douche and a lengthy process of cooling off, from neglect of which arises the catching of chills for which the bath is sometimes blamed. The effect in suitable subjects is in the highest degree beneficial. The procedure of the Turkish bath, as it is carried out at Harrogate and other towns which live by their baths, may be of interest: preliminary warm shower or needle spray, followed by the hot air exposure in three different chambers; then a vigorous shampooing, soap and water lather, a tonic needle douche, and lastly the final plunge before the cooling off: a luxurious process evidently.

Vapour baths are the less commendable and the less necessary, since by their approximation to the effects of water, they do not so freely permit of such evaporation and consequent liberation of sweat as obtains in hot air. The 'Russian' is the type of this variety; in it a temperature of 145° may be attained, and in its home it is followed by flagellation with twigs and an ice-water douche or a roll in the snow.

To turn for a moment from the consideration of these various luxuries to a very practical point : thousands of children in every town go without even one complete bath from one year's end to another, and it is worth considering whether—as suggested by Mr. Rose in a paper read before the Medical Officers of Schools Association—along with every swimming-bath made available to such children, there might not also be a complete equipment for warm douching. Shower baths are recommended as being the quickest, cheapest, and most cleanly where large numbers have to be catered for. There is little doubt that if the advantages of the warm shower have to be balanced against those of swimming-baths on account of considerations of space or expense, the decision should be made in favour of the shower, for reasons not only of cleanliness but health.

Bathing has points of interest of its own. Its ideal form has come to be considered that which can be had in the sea. Neither the ozone nor anything else equally subtle is responsible for the value of this pleasant and health-giving diversion. The effects produced are due simply to immersion in water in motion, and perhaps also in water of high specific gravity owing to its containing a certain quantity of solid material, either suspended or in solution. The stimulating effect of the impact of innumerable infinitesimal material points is precisely that obtained by the whip of the wind when one is driving a speedy horse or motor-car. Three hours after breakfast is the ideal time for a dip ; certainly not immediately after a meal, and equally certainly not before breakfast. In both cases the need of the digestive organs

for the first call upon any available vigour must be remembered. Nor is it well for any one to bathe in a state of too great heat or excitement.

The point of importance in sea-bathing is not to stay in too long, even if swimming be maintained the whole time. It has to be remembered that though swimming will manufacture heat, it does so by draining muscular and bodily energy. Sometimes occult and mysterious powers are attributed to sea-water in the way of the prevention of colds. It is cold that gives colds—not water, whether salt or fresh. If this be doubted, the experiment of trying it in your bath with equal carelessness is worth performing. You will settle the question, for you will catch the cold. Without doubt microbes are fewer and less virulent at the sea-side, and the life is more health-giving at such places than that led by the same people or children in town, but there is nothing miraculous in salt.

Medicated baths are inactive so far as helping their constituents through the skin is concerned, whether these be of soda, salt, pine, or other elixir : our opinion of them, indeed, is practically that which was expressed by Dr. Samuel Johnson with his wonted vigour : ‘ No, sir : medicated baths can be no better than warm water : their only effect can be that of tepid moisture.’

The virtues of radium and electricity have been used to advertise various enterprising spas, but of their action on the healthy skin in minute quantities that can be found in water, wherever obtained, there is little evidence of value. There remains, however, the group of ‘ solid ’ baths, the most familiar of

which are peat, mud, and sand baths. But none of these need trouble the healthy in body.

Mud or peat bathing stimulates the skin by the friction of innumerable minute fragments of plants and other organic as well as inorganic material, such as sand and shells. The mud or peat is plastered on or applied in various ways, frequently hot, or as in taking an ordinary bath: being bad conductors of heat, baths composed of either of these substances may be made either hotter or colder than is possible in water, without discomfort. The action is that of cold or heat with the increased stimulation of the skin by the particles contained.

The sand bath is particularly stimulating or irritating to the skin on account of its composition: its characteristic is the dryness of the heat and the facility with which it permits evaporation. But to any of these must naturally be added the use of water afterwards, if cleanliness is desired.

As a final word regarding the fallacy that the cold bath is the only bath worthy of the name, it may be recalled that the Japanese, who use water hot enough to parboil an Englishman, have proved themselves to be the reverse of effeminate.

### *The Common Cold*

The warding off of the common simple cold is a matter of such universal interest that a word concerning it is not amiss. It is a powerful illustration of the truth that bacilli, or the organisms of disease, are always with us, and is ample warning of the necessity for keeping the body continually fit. There is no need to remind ourselves of what a simple cold

may lead to. But in the understanding of what happens in this commonest of all affections lies the comprehension of many of the most serious risks which daily menace health.

In the event of exposure to draughts the exposed surface at once responds by a vascular contraction and a checking of perspiration—a mechanism which ensures that heat will not be too rapidly lost at that spot, nor the general bodily temperature allowed to drop. The actual cold spot, too, is a place where vital energies are lowered, and an attack of bacilli is more likely to be successful.

In these different factors—the omnipresence of hurtful organisms, the general chill of the blood from a defective vaso-motor response, the diffusion of the strength of the phagocytes, and the actual lowering of the resisting power of any one spot or area of the body—lie ample explanation of the attack that is promptly and often successfully made by those organisms that happen to be favourably placed.

The reason why draughts and chills cause ‘colds’ is now clear. For if there is one place in the human body where organisms are most likely to be present in greatest number, it is the mucous membrane lining the nose, nasal passages, and back of the pharynx, since into these passages are continually inhaled fresh accessions in the dusty air which it is the lot of modern man to breathe from morning till night. The natural sequence need not be further detailed. The best preventive when there is special liability to infection is to be found in that extremely valuable antiseptic quinine, taken in moderate doses, according to the direction of one’s doctor.

## CHAPTER III

### EXERCISE, TRAINING, AND ATHLETICS

THE old Norse and Greek glorification of muscle and the physical body, and the degradations and self-mortifications imposed by Christian hermits, are natural oscillations in this world of rhythm. Apotheosis ended in hatred ; and we are still perhaps not altogether free from the belief that the body is something 'low.' We have a flickering superstition that it must be kept under : that 'life is for work,' as it is phrased.

In this generation, with its advantage of a clearer and more precise physiology, there is less antagonism between the body and the mind, and it is possible to fuse into one harmony the truths derived from both. Exercise, indeed, is chiefly valuable since it helps to develop the psyche, or mind.

Exercise, let us say, affects primarily the muscles, but not a muscle of the body can contract without affecting scores of nerves. There is not one nerve in the body which does not have means of communication with the brain, as well as through these with the rest of the body. All mental processes are based upon a simple unit of action or process called a 'reflex arc,' in which some one muscle fibre is a chief factor. The necessity to consider nerve and finally mind in any discussion of muscle is therefore clear. There is no

muscular hegemony among the principalities of the body, though various ardent physical culturists are endeavouring to inculcate it. Sophocles is still apt :—

‘Not always the huge size of weighty limbs ensure the victory.

They who excel in wisdom are alone invincible.’

The question of exercise in the case of babies and young children is extremely simple. The matter is out of our hands if they are left alone. The amoeba, the simplest form of animal organism, grasps at whatever comes near to it : its means are somewhat ineffectual, blind, and groping, but by sluggish protrusions of its substance it makes distinct attempts to reach the object. There is no essential difference between the mechanism of the amoeba and that which prompts the infant to clutch wildly at its father's beaming eye. Salts in solution in the amoebic jelly are squeezed out, various tensions are altered, and the jelly projects into arms called pseudopodia. The rays which enter the eye of the infant reach its optic nerve, salts in the jelly of the nerve are squeezed out, and as a result of the alterations of tension a message passes to the nerve cell. This is continued and repeated along the nerves running to the child's arm. The change is seen to take effect in the muscle substance, the muscle material flows in one or more definite directions, and the baby's finger approximates more or less to the paternal eye.

The life of a child is the primitive life, where thought is promptly translated into action, and a child's liberty of action should be absolute except in

so far as regards its own safety and that of others. Movement is the natural reaction to all stimuli in the very young: it is essential to their health, to their growth, and to their development, and after these, it is needless to add, to their happiness. The movement of every part of the body from head to foot should be wholly unrestrained. Not a movement, not a single wriggle of body, head, or limbs but has its definite purpose, and here is the explanation of that 'fidgetiness' or restlessness which the thoughtless elders sometimes put down to a deliberate manifestation of iniquity. The nerve currents in children are translated into muscle action: it is only in the more mature that they can diffuse themselves in the higher association areas, in a certain amount of heat and some little thought or imagination, without impulsive movements.

When a Balfour finds it necessary to relieve some of the superfluous brain energy by gripping the lapels of his frockcoat, or a M'Bride finds that speech requires the assistance of table-thumping for all his nerve-currents to be satisfactorily drained, there is little justice in chiding a child who spontaneously seeks an outlet for his emotions by kicking one's shins.

Let the children play, but do not put them in positions where the 'muscular outlet for their cortical storms' shall be an inconvenience to others. Especially is the word 'play' to be noted. A very young child should most decidedly not be 'taught' games. It is to sit or stand or run or roll as seems to it best at the moment; and no considerations of clothes or dirt are to interfere with these primal necessities.

The sensations are to be trusted, in this matter at least.

A child is governed by instincts or by instinctive responses, and its needs are for the first few years chiefly those of the animals. As we are not here dealing with more of education than is comprised in 'exercise,' this question need not be further enlarged upon. Liberty of physical movement must rank with food, air, and light.

The case of the child from the time it enters school-life till it attains the age of puberty is more difficult, for into this stage must enter largely the conscious discipline of mind and morals. It may be stated with certainty that the differential treatment of the sexes is not demanded at this stage. If there is any difference between the physical vigour of boy and girl under the same treatment it is rather in favour of the girl, who attains her maximum more rapidly.

The age of puberty needs most careful watching. It is a time of most rapid development, being, in fact, second only to early childhood in the amount and rate of change that occurs, and it does not at all follow that a mode of life which has been perfectly suitable before this may be satisfactory now. Sleep, it has already been said, must be amply provided for. The ideal course would be that there should be neither school-work nor any other employment demanding mental wear and tear for a year around this period, and that life should consist of open-air occupation with that form of exercise which is most valuable in each case.

From puberty onwards comes a time when the sexes require a scientific differentiation of their

treatment, based upon a recognition of the differences in their function and life-work. That there is a difference in even their reaction to the same course of physical training is perceived by the teacher of gymnastics, for no physical training will induce the rounded muscles of women to take on the knobby character which is so great a glory to men. Women are conservators of that energy which it is the function of man to disperse.

The expert athletic as well as the phenomenally intellectual woman is a *lusus naturæ*. It is to the credit of the sex that woman has not been specially renowned as painter, composer, dramatist, or writer. Yet by a perversion of all complete understanding this has been held her reproach, even though it has at the same time been noted that those women who have excelled in the forbidden paths of either mental or muscular robustness have tended to sterility of actual life. It has not been granted to be fertile in more than one world.

But whilst no man wishes to see an athlete among his women-folk, it does not follow that they should be debarred from participation in the exercises which make for health: and these may well be the same for both sexes.

The solution of the question as to which particular muscular exercise, deliberately taken, is most likely to be conducive to health, may be decided in a variety of ways, and the answers are only likely to coincide if care be first taken to ensure that there is in each case the same understanding of what is meant by health. That matter has been settled, so far as this work is concerned, by our agreeing that it is the power

to live completely—which means that all the desirable faculties shall be capable of their proper employment.

The rational method would appear to be the going back on the history of man himself, discovering what parts of his muscular economy were first principally used, and inferring that these, if they still exist, should form a natural basis on which exercise should begin. It soon becomes clear that the mechanism concerned in locomotion has always been and still is of first importance: and upon his capability of changing his position has been founded all human activity, while by its necessities have been modified vital processes, such as respiration and circulation, together with all other development.

Of all the muscles under the control of the will those concerned with massive bodily movement have been most active for millions of years: they have maintained their value to well within our own times, and it is only now, when man is able to travel faster on machines, that there has arisen any doubt as to the parts of his body which first deserve attention; though it is still realized that the back, loins, and thighs are the regions in which resides 'strength.'

Any system of exercise, then, which does not recognize walking and running as fundamental is bound to be unsatisfactory for muscles and brain: for in the brain are laid down millions of cells, the interests and welfare of which are intimately concerned with the muscles of progression. There is infinitely more in walking than the mere contracting and relaxing of a group of muscles, a fact ignored by systems which tie the athlete to a series of rubber tubes attached to a bedroom door. There is a

variation in the stimuli which meet the eye, ear, and skin in every step of a walk : there is a difference in the work done and the kind and worth of it.

While the child is young it first wriggles along the floor ; later it manages to progress by bringing into play legs, arms, and body ; and, as growth proceeds, arms and legs, and finally legs alone, become the preferred means of movement. The progress from the serpentine to the quadripedal and at last the bipedal form of locomotion is significant. When the erect position is attained the muscles which actuate the lower limbs are not isolated : there is a deep-seated understanding which, at every fresh posture of the body induced by the muscles of walking, provokes actions and reactions through the whole economy. It is hardly too much to say that in walking nearly every muscle of the body is actively promoting the motions aimed at, either by actual contraction or by passive resistance.

The more self-evident of the muscular actions that accompany the movements of the lower limbs are universally recognized, such as the opposite-sided swing of the arms, the movements of abdominal muscles, the contractions of those of loins and back, and the stiffening necessary to hold the head erect. It must be noted, however, that if the arms swing the shoulders also are concerned, that hence the chest muscles become involved, and that these play on the ribs. Also the whole skin is affected by the alterations of tension induced in it by so large a system as that of the limbs.

The vigour acquired by such a method of exercise is of undoubted value to the backgrounds of con-

sciousness, and gives the proper warmth of feeling-tone to sensations, emotions, and ideas.

It is the best method of producing 'wind' and stamina. This is recognized in every curriculum of training. There is in walking no interference with the easiest and fullest breathing, since no forcibly contracting muscles are holding the shoulder girdle or the ribs or the diaphragm in any one fixed position. If you are an indifferent cyclist and endeavour to aid your difficult progress by pulling on the handle-bar, thus fixing the upper part of your chest, the impediment to easy breathing will be at once apparent. For the same reason it is not right when doing dumb-bell or similar forms of exercise to stand with the shoulders well back, as is so curiously and universally prescribed. Stand up well by all means, but the muscles must be 'limber,' not set hard.

The truth that no persistent violent exertion during which shoulder, back, or chest muscles are strongly contracted for more than one or two complete inspirations, is good for the organism, should be the test of value. By this test weight-lifting, for example, is absolutely condemned.

Exercise and feeding are closely related matters. We have in England attained to a vicious method of life whereby the actual amount eaten varies very little even in summer and winter—so that a man thinks if he is eating less or has less appetite even in hot weather he must necessarily be ill. That is, of course, very ridiculous, and due to the three-meals-a-day cult, whereby the healthy hunger instinct has departed from us, and a factitious and deceptive habit has taken its place. There is, indeed, no doubt

at all that most of us eat too much, and that the feeling we proudly aver to be 'hunger' is nothing of the kind, but is due to a vitiation of natural processes by the 'spoiling' of the stomach—the sensations of which are, in civilization at least, most untrustworthy guides to diet.

Our concern is with the organism that is not gluttonous or lazy, but whose desire it is to utilize its sources of energy to the best advantage of body and mind. Four-fifths of the energy available is required to maintain the body temperature, and the remaining fifth is almost equally divided among the processes of bodily metabolism and the actual movements that may be measured in terms of units of work. Dr. Cantlie suggests that 300 foot-tons of work must be performed for health maintenance in external movements of all kinds during the day by a man weighing eleven stone. Such an amount can be realized by walking eighteen miles.

Some stipulation must be made as to the time over which this work is spread, and also as to the speed at which it is taken. The sprinter in his 100 yards exhausts energy that would carry him miles at a walking pace; whereas the housewife, who during the day is up and down stairs an innumerable number of times and who is otherwise almost continually engaged in a number of small progressions, is often quite unable to walk five miles without inconvenient fatigue. The time factor is of the greatest importance in creating a reserve of force, for those people who have accustomed their cells, muscular and nervous, to short outputs of energy are doing little to build up real stamina. A short demand upon the energy of

any system does not mean that there is a correspondingly large stock still available. Where the demand is always small the available reserve is also small, and such reserve can only be built up by effort of a continuous character. An hour's steady walking is much more than equal to two separate half-hours taken at wide intervals. The possession of a good reserve gives confidence and ease, and that exercise which is to build up the necessary reserve must be aimed at, so as to cover all the possibilities in the life of each individual. If the absolute limit to the call upon the physical powers could be foretold, then it would be easy to lay down the routine for any life —this would need a training which would make the limit of strain to be faced quite attainable by the body and yet leave something still in hand. The wise man or woman will adopt a system of averages, and by realizing what calls are likely to be made upon the bodily stamina, will frame a mode of life which will enable all of these to be overtaken without over-exertion.

### *Training*

Every one should be in training, and such training should be an explicit object of school-life. Definite 'training' for a week or a month or a year is of the essence of folly. The physiologist who watches an Oxford and Cambridge boat race must realize with a scientific pang that though it certainly is glorious, it certainly is not right. Our ideas of Olympic Games come from old Greece, but not from the best of Greece. The Greek athletes became a professional class with whom the ordinary citizen could not

compete. These athletes had their Aleiptes, who prescribed their diet and rubbed them in the approved method of the modern trainer. Diet in the earlier times consisted mainly of wheaten bread, dried figs, and fresh cheese ; such meats as pork, etc., were later additions. Their special exercise consisted of taming bulls, carrying heavy loads, lifting weights, bending iron rods, punching leather sacks of sand, and so on—a programme not so far removed from that of the pugilist of our time. Like the pugilist also, their end was frequently by apoplexy. Their rewards, in spite of that interesting fiction of the simple glory of a laurel wreath, were quite comparable with a world's champion belt and its pecuniary accompaniments, or a ' benefit ' to a renowned cricketer or footballer.

There is no intention to cast any slur upon the ' professional ' as distinguished from the ' amateur ' ; but while the professional will probably best attain some special excellence, it is not the best training for all-round life.

A man in fair ordinary condition who proposes to win a sprint, steeplechase, or jump usually allows himself six weeks for this training. At his event he puts the last ounce at his disposal into a supreme effort : and in so doing he may get a dilated heart. As soon as his event is done, he eats, drinks, and lives as he did some six weeks before. Now that is profoundly wrong. Those six weeks should have been carefully retraced in the way of exercise, food, drink, tobacco, etc., and in addition a special allowance of at least a week made for the peculiar strain to which he was subjected in his actual event. That is the

commonest of common sense, and at the end of some twelve or thirteen weeks he would be precisely where he started. When careful training-off is omitted, harm is done, since the only natural method of removing superfluous mechanisms in excess of the daily needs is by degenerations ; and these occur.

The lesson is obvious : if you want to race, race as you are, with no great revolution in your ways of life—making sure first, of course, that your mode of life is that which will permit you to race at all. This is borne out by any healthy schoolboy as well as by some of the best athletes England has produced. The man who can ‘ do his hundred in evens ’ without any alteration in his habits is a better ‘ life,’ in an assurance sense, than the man who, by vigorous training, can take a fifth of a second off this time. ‘ The only training that a young man requires, who is in the habit of living a moderate life, is to avoid such known evils as spirits, tobacco, pastry, and new bread.’

Practice is very different, and depends upon principles outlined in ‘ Habit.’ It is required that the connections—nervous, vascular, and muscular—in the special groupings to be undertaken shall be made as readily and easily as possible, and practice will result in the necessary ease or habit. It should be noted that if habit can ensure an easily working body, the greatest expenditure of energy is only made possible by the higher centres of the brain, by which extra nervous power can actually be poured into the working system.

‘ Staleness,’ which is liable to arise from too prolonged or too vigorous a course of training, is chiefly due to the inability of the higher brain centres to

reinforce the nerve streams in the practised system. It is a brain condition, and is to be treated by stopping or breaking the monotony of exercise or diet and by allowing a judicious rest. Here must be emphasized the share of brain cells in producing fatigue, for long before lower centre, nerve, or muscle would protest, the condition of cortical cells inhibits action.

The value of practice lies in securing with the expenditure of a minimum of energy any desired movement, but though the constant repetition of a movement results in an increase of its power for a given stimulus, this increase of power is not progressive and can never hope to reach that limit possible to concentrated effort. This is why no mere perfection of 'form' will suffice to win. However perfect the apparently automatic part of the body's action, the brain must also participate to secure the best results. No system of training, then, whether limited or lifelong, is likely to be successful which ignores the brain.

There is nothing which bears on life that has not some effect upon physical efficiency, and while there have unquestionably existed many individuals of magnificent physique and mental attainments who paid no conscious attention to such matters, our generation requires to understand, and to act consciously, since the times have so changed.

The wearing of warm dressing-gowns till the moment before an event is a wrinkle known to the American athletes, and worthy of imitation in England. Neither muscles nor nerves can put on their best working pace unless they are warm: the difference in nerve impulse so caused may amount

to many feet per second. Galen, who was physician to the gladiators in his native city, says, ' If any one immediately after undressing proceed to the more violent movements, before he has softened the whole body . . . he incurs the danger of breaking or straining some of the solid parts. . . . By moderate rubbing with a linen cloth warm the whole body beforehand.' After this warm rubbing he counsels the slight inunction of oil.

### *Methods of Exercise*

Three hundred foot-tons must be performed as external work every day by the average man, and the ordinary unconsidered daily actions consume a surprisingly large portion of this in the case of even the most sedentary.

Various objections have been urged against walking when this has to be done in a city, and undoubtedly the country would be preferable. Even in London it is possible to walk for miles without losing sight of trees or grass.

There is no excuse for remaining indoors on the pretext that as little of the town air should be imbibed as possible. Bramall Lane, at Sheffield, is in the midst of soot and smoke, yet it is the headquarters of one of the most famous football teams in the kingdom.

Even violent exercise may be indulged in with impunity in the centre of a large town, and this is well, for there is undoubtedly a somewhat depressing monotony in nothing but walking. The young of man, like that of any other animal, is for only a very short time satisfied with the resources contained in ordinary progression, and this soon becomes complicated

by the instincts which lead to play. Something round will enter into play. Ball games have a foundation deep-laid in our development: from the simple tossing to and fro and the chase of elusive roundnesses there have evolved such complications as golf or modern football.

Ease in rolling first caused a ball to be desired, and when there came to be understood the possibilities of the spin which might be imparted to it, the appeal of games with round things took a long lease on the affections of mankind.

The essence of these ball games consists in walking and running, combined with a training of the eye to estimate flight and distance, and of the body to adjust itself to rapidly demanded positions, evidently an admirable preparation for the sterner necessities of life, which depend in large measure upon the perfection of the movements made available by the playing.

Any game or sport must be judged not from the extent to which it brings any muscle into play, but from the manner and degree of its exercise of those MUSCULAR SYSTEMS which our development teaches us are intended to work together. Muscles are not meant to work individually. In going for a walk or a run a man does not separate out his *gastrocnemius*, or principal calf muscle, and interrogate it alone as to his condition. Movements, *not* muscles, should be studied.

All athletics which exercise the lower limbs satisfy the first demand—that the powers of locomotion must be considered. Golf is probably the ideal form of a gentle exercise which, depending mainly upon walking, yet includes something of value to the training of

arms, body, and eye. Cricket has similarly its recommendations. Skating is always excellent, as are hockey, football, and dancing. The advantages of swimming require no exposition ; by it every group of muscles of the body are fully exercised, but it must be remembered that it is a severe test of condition and stamina. Ten minutes in the water of the sea is sufficient for any one, no matter what the conditions, and the same statement will apply to the swimming that occurs in baths.

Prominent among exercises lacking in completeness is rowing, at least in its humbler forms where the slide is unknown, and cycling ; the former leaves too little work to the legs, and the latter too little to the arms. Jumping, hammer-throwing, and weight-lifting fail in that the exertion is too concentrated. It is a safe rule that abnormal efforts which leave the competitor helpless at the end of his event are foolish.

Boxing, or rather sparring for the love of it, and step-dancing are the best indoor exercises, and there can be little question as to which of these is likely to be the most useful.

Singing is an excellent exercise for the lungs apart altogether from the value of the rhythm in its effects upon the mind. This is likely to be recognized in the training of the British Army, if Surgeon-General Evatt succeeds in inculcating the example of Japan, where the value of singing to the fighting man is thoroughly realized.

Women are not intended to excel in any game requiring either strength or speed. As tennis-players the best of them are not more than half as good as

the best men, and as runners their build, if they are built as women are intended to be, is against them. There are women who have run to hounds on foot season after season and also reared a family, but this as a fact is curious.

Gymnastics and any other form of physical culture that has to be taken indoors should only be resorted to when it is impossible to have outdoor exercise. But gymnastics, since it concerns itself with teaching or helping the body to perform definite movements, is far ahead of the systems which treat individual muscles by causing them to undergo aimless movements. Dumb-bells and Indian clubs have their uses, but are lifeless and mechanical as compared with games, and the actions are too likely to become more or less automatic. Rubbers and other appliances are ingenious, but England will be in a bad way if she has ever to depend upon a nation of bedroom athletes.

What benefits the muscles benefits also circulation and respiration, i.e. the whole body. A brisk walk implies the consumption of four times the oxygen required during rest. If the respirations are to be more rapid, naturally nothing must be allowed to interfere with them, so that along with exercise must always go a freely acting heart and lungs. When the heart cannot keep pace with the demanded speed 'stitch' ensues, and one's 'second wind' means that the heart has succeeded in accommodating itself to the strain. Too great a 'stitch,' resulting in absolute breathlessness, is a warning that must not be disregarded. Evidently, with this need of rapid blood supply, exercise should not be taken when any part of the body is in special need of blood,

as is the stomach just after a meal. Before breakfast, only that amount of exercise necessary to expand the lungs fully and to clear the remnants of the sluggish night air from its inmost recesses is desirable —a few minutes' yawning or stretching does for most people, or simply swinging the arms alone or with light dumb-bells. For the majority, the time spent in the morning tub and rub down, shaving, etc., with ten minutes in the air before breakfast, will suffice for all such needs.

### *Summary*

Training should be a lifelong care and not merely for some special competition. The dismay with which the British are viewing the success of other nations in Olympic competitions is ludicrous. Let the Americans perfect their methods of so-called 'training': these are entirely out of harmony with all-round development and differ for each event, being directed only to that event and to no other. We have the evidence of all history that such specialism while it wins prizes is not beneficial to the country which adopts it. The people of which all the members are capable, able-bodied citizens is much more likely to achieve and maintain national greatness than the people among which under the latest athletic conditions are to be found the greatest number of record-holders. 'Record-holding' and 'fittest' are not synonymous terms.

Exercise in daylight and in open air, and exercise directed to complete living of mind and body, is that form of exercise which will most benefit the individual and the nation.

## CHAPTER IV

### FATIGUE AND MASSAGE

METCHNIKOFF has declared that life which is not ended by disease or accident should extend over one hundred and forty years ; and this statement he buttresses by physiology, pathology, and his own researches, as well as by less justifiable Biblical deductions.

Natural death should occur as the result of changes induced by the imperceptible effects of gradually cumulative fatigue, and therefore the rational method of prolonging life is to prevent the harmful effects of the products of fatigue. The blood of a dead-tired animal is actually poisonous to another of the same species, whereas the blood of the untired can be injected without harm.

In the deterioration of body tissues, caused by the gradual action of fatigue or by poison such as alcohol, is the explanation of the progressive thickening of arteries, and the meaning of the famous dictum of Cazalis that 'a man is as old as his arteries.'

Another factor in the production of devitalized arteries is 'strain,' which alters the rate and impact of the blood stream.

A third cause of deterioration is lack of activity, which, by failing to secure the necessary circulation,

causes an accumulation of effete products, as in the atrophy of disuse.

The prevention of strain and the removal of fatigue products is the physiological guide to the prolongation of life, though such knowledge is far from that of an elixir of life.

The essence of fatigue is the action upon the cells of the brain of certain acids and acid salts formed during the conversion of the stored up energy of the tissues into effective work ; an acidity which is normally removed as fast as possible from the body in the urine. By the circulation of the lymph and blood these substances are removed from the points of their manufacture into the general circulation, through which they reach the brain, and laving its cells with their numbing influence, cause the brain to call a halt on further activity. For the ready energizing of brain and all body cells, they must be surrounded by alkaline fluids. Could weak alkaline fluids be injected to reach the protesting cells, then fatigue would vanish ; but nature's way is by gradual elimination, and for it rest is necessary. If by any sudden excitement the circulation of the blood is hastened, the same effect is secured temporarily. Thus a burst of anger, joy, or other profound emotion is well known to overcome the most deep-seated fatigue.

The paralysing acidity is naturally removed during rest or sleep. There are many devices by which fatigue may be ignored for a greater or lesser period, but they only postpone the final reckoning. Without considering the action of drugs, we may note that there are articles in daily use whose chief aim is the delaying of fatigue, but of them all there is only one

group which directly stimulates the cerebral cells. Coffee, by virtue of its caffeine, and tea and cocoa to a lesser extent, have this cerebral action. Since none of these substances is a food, it is very evident that they supply only a goad, and that too prolonged indulgence will result in disaster. These articles—drugs they undoubtedly are—are not to be used unguardedly more than any other drug. Alcohol comes into a different category ; it temporarily excites the circulation and whips up the heart, and so overcomes fatigue : but in the end both the products of fatigue and of the alcohol are cumulative in clogging the brain cells. In the natural process the brain cells are the first to warn us when we have done enough. If by our stimulants we obscure warnings it is evident that a worse thing will happen, such as neurasthenia, or more irreparable brain damage.

### *Massage*

Massage is a device of almost universal value, but one which has hitherto been far too limited in its application. Hippocrates writes of rubbing or massage : ' Rubbing can bind a joint that is too loose, and loosen a joint that is too rigid. It can make flesh and cause parts to waste ; moderate rubbing makes them grow.'

Homer speaks of rubbing and anointing. Heroditus lived two thousand four hundred years before Sandow, but cured disease by gymnastics and rubbing, and himself lived to be a hundred.

By stimulating the circulation waste products are more quickly removed from their place of origin, from the brain which registers their presence, and from the

body generally. To quicken the heart by the direct action upon it of drugs of course suggests itself, but if the waste products are sent more rapidly into the blood stream and this stream itself quickened, the same end will be achieved, and that is what massage not only professes but does. Every one believes in its benefits who also believes in the virtues for himself or his horse of 'a good rub-down.' Among certain savage peoples it is a ceremonial and the highest gift of hospitality, and travellers tell us of its wonderful soothing and stimulating effects.

The play of the muscles, as well as their own contraction and squeezing, promotes the sluggish flow of the lymph, which bathes the cells of the body. This lymph contains all the excretions of such cells as well as their nutriment, so that the need of its being moved on regularly is evident. In the removal of depressing excretions also lies the secret of that real joy of life which ordinarily can only be obtained by bodily exercise.

Massage takes the place of voluntary muscle movements in promoting the lymph and venous flow to the heart, if the rational direction, that of 'anatrisis' or rubbing 'up,' be followed. It is clear that rubbing a leg downwards towards the toes will actually retard those processes it is meant to facilitate. Massage used to be extremely laborious work, and it was recommended that the physician who undertakes it should drink a glass of good old wine every fifteen minutes; but massage is a matter of skill as much as of endurance.

Gentle rubbing of any part of the body stimulates growth, a fact known and utilized by beauty doctors

who secure the success of their own face foods by rubbing them in; while it is equally true that vigorous rubbing will remove superfluous fat—a part of the truth known to those who treat obesity successfully, with no matter what preparations, by vigorous friction.

Massage is not, however, a matter of simply rubbing anyhow so long as the direction, towards the heart, is right. It necessitates a considerable amount of manipulative skill. In this country we are still content to leave the virtues of an admirable treatment in the hands of bonesetters and the unqualified, but on the Continent, and especially in France, they have long had an appreciation of its importance, and do not think it beneath the dignity of the physician himself. Germany was slower than France, but at the University of Berlin there is a 'Professor of Massage.'

The action of massage may be demonstrated by a simple experiment. Squeeze along the vein running on the inner side of the ankle towards the heart and it will empty; the vacuum thus created cannot be filled from above, on account of valves in the vein, and it has therefore to be replenished from below, which means that the venous circulation has been stimulated. Such a movement in a precisely similar fashion affects a number of lymphatics, so that this circulation also is encouraged, and as the lymph is the fluid most intimately surrounding the cells, these cells will be relieved from stagnant material. That is what is achieved by simple, gentle stroking, and the next process is naturally directed to reaching the deeper tissues.

It is in this deep kneading that the skill particularly is required, for bruising is most particularly to be avoided. Muscles are toned and nerves soothed, so that while the total effect is sedation, there is afterwards the ability to undertake muscular work should this be needed, no matter what the previous fatigue. The flicking, slapping, or tappings that sometimes finish the process have also their stimulant effect. Such flickings—birchings indeed—were at one time a jealously guarded secret for the rehabilitation of those devitalized by excess.

By promoting a feeble circulation massage is an invaluable beautifier, while for all weariness and many of the simpler aches and pains there is nothing more efficacious. In cases where violent exercise is to be undertaken it is an excellent preparative. During the intervals of a contest, as for example boxing, nothing can take its place as a revivifier, and the same may be said where it is required to recover quickly from the bruising, fatigue, and depression consequent upon prolonged strain of either body or spirit.

## CHAPTER V

### CLOTHING

CLOTHING with the average person means the preservation first of decency, and second of an even temperature. A few fortunate ladies are able also to regard it as it was intended to be when first discovered—an ornament and attraction.

The key to all health lies in the simple statement that the best temperature of the body is at some  $98^{\circ}$  Fahr. ‘Man is homiothermal, and  $98.4^{\circ}$  is the optimum temperature for the average healthy individual.

From the tribes of Tierra del Fuego we realize that clothing is not essential for even purposes of warmth, and that the skin can become habituated to the greatest rigours of cold, while in Central Africa, etc., we are led to perceive that they may be dispensed with as a protective against heat. Even our woad-painted ancestors found life supportable in these latitudes without clothes.

But there is another side to the matter. Clothes are a matter of economy. The body heat has to be maintained either by consuming food and burning up its energy by work, or it must be saved from undue wasting by protecting the skin, which loses the body heat from undue exposure. It is cheaper to preserve heat than to manufacture it. Clothes

then, in addition to warmth, must maintain intact the skin functions.

Since we are discussing a means of economizing the resources of the human organism, clothes clearly must add as little weight as possible, and investigation must be directed to those materials which possess most warmth for a given weight. The desideratum is a covering at once light and a bad conductor of heat. The lightest of all non-conducting coverings is still air, and those marvellously warm coverings wool, fur, and feathers are in the last analysis interrupted layers of air. The actual substances used to form the strata and cellular air spaces seem to be of comparatively slight importance.

The wearing of clothes in layers has arisen from the impossibility of obtaining in the one material the dual possibilities of warmth and cleanliness or skin protection. Naturally the warm is the external of the two. Least interference with the functions of the skin is obtained by the clothes being highly absorptive, a quality very evidently required since some fifty ounces of water from the sweat glands alone are evaporated by the average adult daily, while in addition there is a continuous though slight exhalation of other gases—two litres a day of carbonic acid, for example—along with some solid constituents in the sweat, and a comparatively large amount of sebum or oil from sebaceous glands.

It remains for each individual to apply the necessary tests to his own raiment, with the recollection also that, if there are differences in individuals, there should also be differences in the amount and absorptive and non-conducting qualities of their clothes.

*Clothes*

The clothing of the few-days-old infant should be investigated by the father, since, after thousands of years of feminine inventiveness, the unfortunate child is almost as poorly catered for in this respect as ever. Next the skin of the trunk, but covering it for only a few inches, is usually placed a tiny chilly cotton or cambric garment somewhat resembling a chemise, and useless for absorption or warmth. Encircling the abdomen is round after round of an interminable binder, also non-absorbent: it is no exaggeration to say that the average man, when he first sees this binder applied, will turn giddy in sympathy with the infant as it is revolved and revolved and revolved in conformity with the needs of this appalling garment. The excuse for it is umbilical rupture; but two folds of a more suitable substance would be ample. Outside these articles are layer after layer equally ridiculous. In the result the arms are left practically unprotected, the chest and belly are defrauded of possibility of expansion, and, finally, yards of dragging, clinging long-clothes are super-added to check to the greatest possible extent the movements of the legs. What the child needs is a soft, flexible, absorbent covering from neck to heels, including the arms down to the hands, and made to fasten efficiently and completely down the back; outside this a substantial non-conducting substance also fastening at the back; and for purposes of adornment any third superficial addition that may be suggested, always providing that the looseness of the other clothes is not infringed on.

Clothes of children slightly older, while they cannot entirely ignore the lack of formation of fixed habits, have yet to be planned on account of that uncleanliness which joys in 'mud-pies' and similar delights. The passage from the petticoated to the trousered stage in boys is guided apparently by custom or fashion. However 'sweet' the combination of short socks, bare brown knees, and dark knickers may be, it is entirely unphysiological. It may be noted that joints are places of little metabolism; they take little part in the processes which originate bodyheat, and are dependent for their supply on sources in their neighbourhood. They are points of assailability by cold, and require all the more to be protected. There is a common affliction of growing boys which has in the past been comfortably referred to as 'growing pains.' These pains are, however, rheumatic.

In girls, at the age which corresponds to the trouser stage of boys, there is usually less reason to complain of their clothing.

In more than one respect her older sisters might learn a useful lesson from the clothing of early girlhood. The boots at this age are adapted, so far as possible, to the shape of the feet and comfort, and the weight of skirts, petticoats, etc., is not dependent from the waist, but, by its attachments to the clothing of the upper part of the body, is suspended—as it ought to be—from the shoulders. So suitable, as a rule, is the clothing of girls of the better classes as compared with that of boys of the same age that there are writers who credit this with the better physique possessed by such girls. When to the

short shoulder-supported skirts of the girl is added an additional foot in length of material, and the total weight of such material transferred from the shoulders to a band compressing the belly, it is easy to perceive the harm that is done. Dr. Cantlie condemns unsparingly even the belt worn by men at cricket, etc., if this is girt above the crest of the haunch bones, and not just below it. Much more serious is the harm to women caused by the too firm pressure of waistbands ; they are responsible for many of the disabling minor pelvic inflammations.

Among adults the average man's clothing is preferable in every way and for every reason to that of the average woman. It is lighter, warmer, more suitable to every variety of movement, more sanitary, better adapted to the protection of all susceptible parts, and is carried with a less expenditure of energy, and with a minimum of harm caused by either weight or tightness. The King of Cambodia is reported to have said : ' European women wear far too many clothes. They should wear no more than two garments, one fitting close to the skin, the other covering the first. Besides they harness themselves too tight . . . at least their legs should be free.' Examples of a rational feminine garb his Majesty was able to illustrate vividly by the production of his own dancing girls.

By a curiosity of custom all men must go with covered head in the public streets, and even, by an unwisdom which the profane might readily explain, in Parliament itself. It cannot be urged that the head must be covered to protect it from dust and other contamination, since nothing can be said upon

this point which does not apply with still greater force to the face—and that is always uncovered. Of all men's hats the Panama is the lightest ; it is also the easiest fitting ; its colour is in its favour ; it is sufficiently cool to temper the rigours of the Tropics and warm enough for a body-region that actually requires no protection on this account. Of the ' bowler,' all that can be claimed is that while for every other reason there is nothing to choose between it and the top-hat, it has the advantage in being less high and more weather-worthy. But there is not a single point upon which the top-hat can be eulogized, except that it is not quite so hot as the motor-cap. The boating-straw is occasionally efficacious in shielding from sunlight through its possession of a brim, and it certainly does not add unduly to the height ; but that is all that can be urged, since it is difficult to keep on the head, is by no means as light as it looks, and even when well padded is with difficulty made comfortable. Caps of every kind are dirty. They consist of a layer of almost impervious material lying close on the hair, and are hot and unhealthy. The absence of pressure upon the arteries, and indeed of any firm constricting margin, accounts for their popularity, as well as the ease with which they maintain their position on the head, and the advantage of the peak for shielding the eyes.

Male upper garments may be slumped as short or long. As at present made they all meet more or less the need of non-conduction and are warm proportionately—a property which is increased when to them is added a silk lining.

Waistcoats are as absurd as the first garment which

approaches the skin of the new-born child. They are thinnest at the back and sides where are situated the bulk of the lungs. They afford no protection to the kidneys and but little to the belly. They do not even extend to the apex of the lung, and the apex of the lung is the favourite settling-place for tubercle bacilli.

For the lower limbs men are limited to knickers, and their accompaniment of thick warm stockings, or trousers with a diminution in the foot-wear. If the trouser has its insanitary aspect by approaching so near to the ground, there are yet certain advantages of warmth to be gained by an outer loosely fitting garment. That 'turning-up' of trousers at the feet is as objectionable in daily life as it is found by the management at, for example, Monte Carlo, and for the same reason, viz. that in the fold extraneous articles and material may lodge.

The proper warmth of body having been secured by a judicious system of external apparel, the needs of the skin on the other count will be satisfied if 'sweatiness' is avoided. The need being understood, there is no excuse for any man complaining of his under-clothing, as there is no need to restrict oneself to the presumable impeccability, with its discomforts, of wool, since cotton, linen, and silk of the same value for the purpose may now be obtained.

Of what avail to wash one's hands carefully and then to embrue them with the weeks of accumulated dirtiness contained in pockets? Money, keys, letters, and hands themselves all contribute to the condition. The trouser pockets are the chief offenders. Turn them inside out in a suit that has

had a few weeks' steady use, and the dirtiness will call aloud.

Probably no article of clothing has been more maligned, and probably no garment is more useful when it is used properly than the white shirt. Its scientific function is that of revealer of dirt. The essence of its being lies in its spotless cleanliness. The daily interposition of one absolutely clean garment between the ingrained dirt of the outer clothes and the semi-saturated layer of the underclothing is of great hygienic value to the body. As an article of genuine clothing it is of course contemptible, as it is neither absorbent nor warm.

The change to 'evening dress' with its accompanying enforcement of ablutions that might otherwise be neglected, is praiseworthy: it means a complete change of the layers of air which rest comparatively stagnant between the different garments, and the skin and the individual cannot but benefit by such change. To the actual physical benefit is added a more subtle stimulus, due in some cases to the intangible alteration of the mental and cerebral attitude by the immediate corporeal environment.

Evening garb itself is a very different matter, particularly the feminine variety of it upon which so much war has been waged. The old quatrain defends, yet points the attack:—

'In an evening dress, the nymphs nowadays,  
Scarce an atom of dress on them leave;  
Nor blame them—for what is an evening dress  
But a dress that is fit for an Eve?'

While, indeed, change of dress is praiseworthy,

and while naturally the texture of clothes worn indoors may differ greatly from that of those designed for the varied requirements of the day, there is only custom to ban us from selecting any form or colour we choose for evening wear, and the exuberance of shirt-front with which evening afflicts men is little more sensible than some of the follies of women.

Amongst articles of clothing for women such monstrosities as openwork blouses, openwork stockings, meaningless garments without sleeves, corsets, skirts extending to the ground, etc., sufficiently condemn themselves. A modified kilt, or the ordinary walking skirt slightly shorter than at present, would preserve that lack of bifurcation which apparently is requisite for the manifestation of sex.

A vicious standard of feminine beauty definitely attributable to the morals and demands of men has preserved some form of wasp waist for at least thirty-five hundred years, with the corset that accompanies it. And this instrument has been held responsible for red noses, palpitation, greasy skins, ovarian and uterine troubles, premature wrinkles, grey hair, varicose veins, and piles.

Athletic garb proper, while in days of ancient Greece it resembled that in which 'Mulvaney took Lungtungpen,' is simply, in our time, that minimum which meets a modern canon of decency. We note, however, that flannel for even the cricketer has been displaced.

The late Mr. Gladstone bewailed that the outfit of the modern undergraduate, as he stood, could be represented in value by a five-pound note; but on this flimsiness we congratulate ourselves. Our

fathers built clothes as they built houses, to stand or to wear for ever ; but such clothes could not fail to become intolerably dirty. We know that a rag doll is efficient to cause a zymotic outbreak six months after it has been used by an affected child, and there is little doubt that certain inexplicable past calamities have been due to carefully hoarded clothes.

If the practice were insisted on of workmen wearing washable overalls, the English streets and public conveyances would be greatly improved in appearance and the workmen themselves cultivate a greatly needed self-respect ; at present they are an offence to every bodily sense, and a menace to every attempt at sanitation.

## CHAPTER VI

### THE SKIN

A 'GOOD' skin cannot be other than a healthy one, though equal degrees of health are not necessarily represented by the same appearances. Any attempt to make the complexion of a dark, coarse-fibred brunette take on the texture, finish, and gloss of a thin-skinned and fairer sister is doomed to failure.

Anæmia with its pallor of skin and mucous membranes ; jaundice and its distinctive superficial tinting ; constipation and other defective intestinal actions and their resulting muddy or earthy complexions ; with a host of others, write their history plain to the most casual observer. The skin, like the eyes, bears faithful witness to the various carelessness and imprudences of life's conduct. The seat of innumerable nerve endings ; the fabric upon which abut over ten thousand square feet of sweat glands ; in which are set hundreds of thousands of hairs, the skin is protective to the whole body, the principal regulator of its working heat, and the most important of the mechanisms by means of which man attains to a harmony with his environment. Consider the helplessness of man were he unable to distinguish by the nerves of his skin between fire and water ; or, what would result if there were no warning of what is painful ; or, again, what would happen if he were deprived

of the sense of touch. Cool it too greatly, and a finger will be lost without pain or warning. Heat it beyond that point where it can control the internal heat, and apoplexy and death will follow. Thicken it unduly, as occurs in that curious and rare condition called ‘scleroderma,’ and all bodily movements become difficult and finally impossible, for the resistance offered by this ‘hide-boundness.’

That superficial, slightly greasy surface, clothed with an impervious coating of horn or keratin, is not skin proper at all. This, with a few other cell layers also more or less converted into keratin and the strata from which they are derived, is merely a skin product directed towards its own protection, and is, in fact, precisely what its name indicates—‘epidermis.’ The outermost layers of epidermis consist of dead cells, united in one continuous, impervious membrane, interrupted by the openings of sweat glands, and the exit of hairs with each its own sebaceous follicle. Deeper, the epidermis is formed of living cells, from which the outermost are renewed. A man changes his epidermis much oftener than every seven years.

The lines of importance in ‘Finger-prints’ are due to the arrangement of nerve-endings upon ridges formed in the true skin, and are most numerous where touch is most sensitive—in finger-tips.

Epidermis with hairs, sebaceous glands, and sweat ducts being all dependent for their blood and nerves upon the deeper true skin or dermis, which draws in its turn from the blood supply and nervous force and material of the body, there is no difficulty in perceiving why the rational treatment of the skin is

through the preservation of the health of the body. Beyond keeping it warm, clean, and uninjured there is no direct method of benefiting the skin.

Deficiency of clothing, or dirty, unsuitable or excessive clothing, will account for skin affections like chilblains, harsh or 'chapped' hands or features, ringworm and other parasitic diseases, oily skins, excessive sweating, corns, and so on. Too limited a use of water as well as, be it noted, too much washing, will tend to definite lesions, and it causes usually a definite skin rash, as might be expected.

The influence of water upon the skin was dealt with in discussing bathing, but there is a difference between the water which is most suitable for drinking and that which serves best for washing. Country rain-water is most desirable for toilet purposes; because of its 'softness,' that is, freedom from lime salts dissolved by water drawn from the earth.

What should be aimed at in washing is simply the removal of all matter superficial to the outermost layer of the epidermis, and this with a minimum of effect upon the epidermis itself. The persistent application of chemicals, and that is what the use of soap amounts to, can hardly be regarded as a mechanical process of this desired nature. Soap, in older times was probably a mixture of fine ashes; and of the value of such powder many smokers are still aware, since they utilise their cigar ash in brushing their teeth. A similar mixture with similar action is a handful of fine oatmeal used instead of soap where the skin is irritable.

Water alone has insufficient power to remove oily secretions, and the colder the water the less its effect.

There is sound reason for the Mohammedan objection to water other than 'running' for toilet purposes. Presumably we trust to the towel to cleanse from dirty water. The rational method followed by a few is to use a second basin or bathful since the running tap is neither convenient nor economical.

The faithful user of soap, of whatever degree of refinement, can hardly hope to possess a natural skin. Milk baths and rose-water baths are merely freaks of fashion. None can compete with the simple device of finely-ground oatmeal in water. It is not expected that soap will be displaced, but it is advised that more care be taken in its choice, and such care, will best begin with the skin of the infant.

The best soap will contain a minimum of free alkali, and must justify the title of 'superfatted,' and soft warm water must be used for it to cleanse sufficiently. There is no need of free alkali since, when soap is dissolved in water, it splits to a certain extent and liberates some portion of the alkali composing it. The tendency of alkalies to destroy all proteid or albuminous surfaces by dissolving them must produce a weakening effect upon the skin. By the action of alkali upon the sebum of the skin has been explained the cleansing power, but this may probably be quite as much due to the ability of soap to emulsify the oily débris upon our surfaces.

The fatty basis of the soap is of equal importance, and care must be taken that this has been neither unsuitable nor rancid.

Water should be at an absolute minimum in the soap itself, and the lasting power, with an unchanged condition till the tablet is a mere wafer, is the best

test of freedom from this adulteration. Cocoanut soaps are particularly suggestive of dishonesty from the ease with which they may be made to contain a very large proportion of water, and yet remain perfectly hard. But cocoanut soap has its use, since it can be utilized with salt water. Yellow soap contains resin, and a mottled soap is not, as it used to be, a comparative proof of purity. Strongly scented soaps are always objectionable, not merely from their smell but because the object they have in view is simply disguise, while medicated soaps are largely futile. Norman Walker says : 'Theoretically, soaps should be more useful as vehicles for drugs than they are.' One of the best antiseptic soaps that is made contains, the makers claim, some five per cent. of carbolic acid. Yet at each washing of the hands in which this soap is used a pint of water or more is poured into a basin, and the small portion of soap that is dissolved to make the lather is supposed to form an efficient defence against organisms ! To make your soap of any antiseptic value it would be necessary to dissolve a four ounce tablet of it in each pint. Walker again says : 'They (medicated soaps) have their chief sphere in cases where the action of soap as soap is desired.'

Anointing the body has been practised from very ancient times, and the oil with which the heroes of Greece were saluted at the hands of fair maidens has its counterpart to-day in the cold creaming with which the lady of fashion refreshes herself after her late nights. Before athletic contests, too, it was the habit in the older times to rub oil into the body, though this was roundly denounced by Pliny as an

error imported by the Greeks whilst other philosophers considered oil the medicine of madness on account of its effect upon athletes. One can readily see the value of an oily skin to wrestlers, and also its use in warding off cold from those stripped for their contests. In the actual treatment of the skin and body by rubbing, the oil was useful simply to prevent skin irritation. Oil on the healthy skin is useless. Cold cream comes into a different category.

### *The Face*

The face is the most important of the regions where may be observed 'objective mind,' as Clouston terms it. For it is by the muscles of the face that we can still convey the greatest number of explicit messages, without the intervention of speech. Undoubtedly this ability to show physical states by facial muscular groupings is becoming less valuable, since it is an exceedingly inferior method of communication, but the retirement of facial muscles into obscurity has been postponed indefinitely, on account of 'beauty of expression,' such beauty depending upon the preponderance of special muscle groupings. The blank face of ignorance, or idiocy, shows readily how astonishingly much of beauty is due to the action of muscles of expression.

In infants, on account of the naïveté and shamelessness with which they enunciate immediately any emotion of injury, joy, or complaint, physiognomy approaches to an exact science. Abdominal troubles, for example, draw oral lines of suffering; respiratory affections have their nasal signs, and brain irritations are indicated by a most unchildlike frown. Facial

habits are soon acquired, and while the undesirable ones definitely mar beauty, they have a reflex effect upon the individual which is all for harm.

The notorious unwinking stare of those of our race who thus convict themselves of possession of the highest 'ton,' and the general unemotional appearance of the typical English of either sex, as understood by critics from abroad, arises, we like to believe, from a high appreciation of an unlined skin, and not from vacuity or hardness of heart or head. There is no doubt also that any one who smiles by elevating his cheeks, and crinkling the skin horizontally at the outer margins of his eyes, will sooner or later be afflicted with wrinkles. It is true that there is compensation in the kindness of expression, but that may not appeal sufficiently to those who prefer not to carry such a certificate of character.

Wrinkles may be avoided, or those alone incurred which shall be least disfiguring. The primary consideration is supervise the expressions, and consequently the states of one's mind, a matter which goes very deeply into hygiene. But the skin itself has a say in the degree of readiness with which the folds in it induced by muscular action shall be stereotyped, by its inability to eliminate these when the muscular action has ceased; and this will depend upon its health and elasticity. Use will cause them, misuse more than all, but time has no more to do with it than it has in terminating our lives. Three straight lines running up and down was the visiting card used by Old Age in the *Autocrat of the Breakfast Table*, and old age according to Wendell Holmes begins at forty-six. The brow of Spencer was, how-

ever, unlined to practically the end, and this he himself explained by never allowing himself to sit down to what is termed hard-thinking. He believed fully in waiting, if one were equipped. ‘Don’t worry,’ therefore, after all the fundamental rules of health, is the first of all maxims that concerns the facial skin.

Elasticity is a most important requisite for recovery from any of the set lines into which the skin may be thrown, and the maintenance of such elasticity must be at the basis of all cosmetic treatments which are not to do harm. Firm strapping of any part of the face will clearly interfere with this property ; and it will most evidently add to an already existing lack of tone, with a future increase of the evil it is supposed to attack. Since wrinkles depend partly upon relaxation of the skin and partly upon relaxation of some muscles accompanied by over-use of others, an effective treatment must include all the factors.

Steaming the face will attend to a general relaxation, will ‘open the pores,’ and soothe the muscles. From the extent to which the face is exposed, and the necessity of frequent washing, the water should be soft as well as warm, and a superfatted good soap used for cleansing. It is in the softness of steam—which, of course, cannot contain the mineral salts which no tap-water is without—that there lies an unquestionable advantage. But whether steam or warm soft water be used, it requires to be followed by the bracing effect of a cool water, which also should be soft. An occasional facial massage is of great value, and to assist this the smallest possible quantity of pure olive oil. The oil is not intended for absorption ; this is not necessary with an ordinary

skin, and is of doubtful value with any except the excessively dry, but it affords a preventive of irritation. Such massage requires a knowledge of physiology or anatomy, or at least of the complicated lines of lymph and venous flow. The object is to promote circulation by advancing the fluids of the skin and not to retard it by pressure in the wrong direction.

So far as diet is active as a beautifier only a word is permitted here. Alcohol is absolutely condemned from its dilating effect upon facial, and particularly nasal, blood-vessels. Meat should be limited to its minimum. Milk, fresh fruits, and vegetables are the best staple, with bread, cereals, and fish, of course, of any diet. ‘Professors,’ interviewed on sea-fronts, who manage to subsist upon three gallons of milk a day, or the lives of ladies who die at one hundred and ten and thereabouts and who possess the skin of a girl of twenty by virtue of living forty years or so on milk, may or may not be veracious. Milk is an excellent adjunct to the food of civilization, but the dilated stomach must follow the imbibition of such quantities. Dyspepsia, needless to say, vies with alcohol in its production of unbecoming nasal tones.

Creams and powders of many kinds are in feminine demand, but these have their demerits. The typical cold cream is the pharmacopœial unguentum Aquæ Rosæ, and such creams are not intended to be used like ointments and rubbed in. They are best applied by thickly smearing the skin; by the continual evaporation of water from the large surface thus presented to the air, and a compensatory removal of water from the underlying skin, they give the pleasant coolness for which they are intended. Pure oils, fats

or grease, when rubbed in, enter the superficial cells, and to dry skins are to this extent therefore beneficial, to a healthy skin they are harmful. Powders act by absorbing perspiration and other liquid material of the surface, and unless excessive they have not the failing of ointments in damming back secretions, but they rapidly become sodden and proportionately useless. In addition to sopping up fluid, a film of powder will relieve the skin of irritation, contract the vessels, and cool it. Carbonate of magnesia is one of the best simple dusting powders in virtue of the large amount (five and a half times its own weight) of water it absorbs; oxide of zinc takes up only a quarter of this quantity. But orris and other vegetable powders having no chemical action are safer. Pastes are mixtures of oily materials and powders, and have action accordingly; their characteristic is the large amount of powder they contain. Pomades usually contain coca butter. Glycerine is one of the commonest and at the same time the most mistaken application to the skin; many skins it irritates, while others, from which it undoubtedly draws water, suffer afterwards from the extraction of so much fluid; undiluted it should never be used.

Paints, dignified by whatever name (of which pure rouge is the best), varnishes, enamels, and the rest require only the mention of condemnation. Rouge, however, is being supplanted by the ultra-refinement of the deposition of coloured particles within the skin by means of the electric battery. This form of tattooing—for that is what it amounts to—will certainly, under antiseptic precautions, do no harm if the proper materials are used; though the ad-

vantage of a perpetual blush upon the skin in all circumstances would seem to be questionable. Lead-poisoning has been known in connection with facial paints.

Arsenic is credited with the production of the wonderful complexions of the Styrians, and they are said to consume even two or three grains daily, one grain being an ordinary lethal dose. Small medicinal doses of arsenic are excellent as a tonic and doubly so, therefore, to the skin.

Sunburn caused by the chemical rays of light, and freckles, are usually amenable to simple treatment like that of weak organic acids such as are contained in buttermilk or watered lemon-juice, or to borax, etc., etc. Broad-brimmed hats and parasols have been designed to obviate the necessity for such cures. Cold creams have here a distinct sphere of importance.

Acne spots or pimples arise from a preliminary 'blackhead,' meaning a sebaceous gland blocked with oily material and dirt, in which necessarily bacilli find an excellent nidus. Their special occurrence at puberty shows needs of greater cleanliness at this period of increased metabolism.

The elimination of warts is simple: a splinter of wood or match dipped in pure nitric acid and pressed well in usually suffices with one application; if carbolic acid is used it requires several repetitions. An older method consisted in 'strangling' the excrescence by a silken thread tied tightly round its site of attachment to the skin, and so left tied till withering occurred.

Moles require more careful attention, and should on

no account be irritated by maltreatment. If there are hairs rooted therein it is best to dispose of the hairs first by electrolysis and then to attack the mole itself by the same agency. Superfluous hairs anywhere are also best removed by electrolysis, which, if done by a skilful operator, causes neither pain nor scarring.

The 'double chin,' points to a want of exercise of the muscles; firm massage will remove the superfluous fat and generally fulfil the necessary conditions better than strapping, though this is not altogether ineffective. The existence of any such obesity of the face indicates, however, that the whole mode of life and diet requires examination.

Occasionally it is desired to remove a dusky discolouration of the skin of the neck or shoulders. Peroxide of hydrogen in a five or ten per cent. watery solution allowed to remain in contact with the skin during the night is frequently sufficient. It is not to be forgotten that peroxide of hydrogen is a powerful bleaching agent and a destroyer of protoplasm, from the too frequent or careless use of which a skin may be considerably damaged.

The lip is a favourite site for a form of cancer, and the predisposing cause to such cancer is irritation. Such irritation may be supplied in the case of the cigarette smoker by adhesion of the paper of the cigarette, necessitating a continual stripping of this, with possibly some of the membrane of the lip along with it. Pipe smokers must observe that there is no sharp edge on their favourite pipe for the same reason.

## CHAPTER VII

### THE HAIR

THE police courts, poor-houses, and rivers afford us doleful testimony of the importance that is ascribed in this age to the possession by men of hair from which the natural pigment has not departed.

Hair pigments, whether black, brown, golden, red or any other tint, give no indication of virility by its special colour, and shows little loss of such virility by its departure. Surely we are past the stage of those ancient personages who believed that strength lay in the hair! I have not yet heard that men have been refused situations on account of their abdominal proturbance, yet this latter indicates a sufficiently grave condition of malassimilation and fatty infiltration, which is pronouncedly pathological.

Hair upon the head or the face of men is a vestige of a structure that has had important values in the past, but which is nearly useless, save for æsthetic purposes, in our climate in the present. Nature has her own way with such survival-structures, and greyness and baldness indicate the finger pressure by which she is gradually eliminating hair. Probably we become greyer earlier than used to be the case; probably also we are becoming balder; but these things prove nothing regarding fitness, for men are living longer.

Hair is an effete structure whose place has been taken by various articles of attire, with the result of freeing bodily energy for more important bodily concerns.

It is known to every one who has glanced over the advertising columns of a newspaper that the hair follicle in which the hair is imbedded and grows is situated upon a little elevation of the dermis—the hair papilla—and that here is the actively growing part with its consequent blood and nervous supply. Hope for the hair is not lost, no matter how complete the baldness, so long as the papilla and the follicle are intact. Such baldness that may be recovered from is that which occasionally follows fevers, or prolonged worry, and that curious form which occurs in patches, and is named ‘alopecia.’ It is possible that, from the general interference with vitality that occurs in debility, there is an inferior ‘ring’ of hair produced at these times, a place in the hair, therefore, which will not be able to withstand the ordinary wear and tear. Or again, the opportunity of weakness thus given the bacilli which always inhabit a hair follicle or its neighbourhood may be sufficient for them to destroy the hair—just as occurs at the ‘neck’ of teeth—with the result again that it must drop. It is very plain that the state of the blood or blood-vessels, the condition of the nerves, and the activity of any micro-organisms present might each or all of them produce the final effect. With a still active follicle the treatment necessary to restore the hair suggests itself: attend carefully to the cleansing of the skin; stimulate the blood supply by local applications such as capsicum,

jaborandi, ammonia, or—one of the best—paraffin, and aid this stimulation by judicious rubbing, which should be done with the fingers ; at the same time attend to the general system. The same applies to the falling out of hair, which occurs in practically every one who wears hats or headgear incessantly, and also in many who do not. As a curiosity may be noted a recipe for baldness dating from the time of King Chata : ‘ A mixture of dogs’ paws, dates, and asses’ hoofs ground up and cooked in oil : rub the preparation vigorously into the head.’

The scalp-covering subserves principally the function of warmth, yet we add to it the most unscientifically devised of heat incubators, many of which have to be pressed firmly on in order to maintain their position, and which by this pressure occlude the arteries which nourish the scalp and hair they are intended to protect. Such covering, particularly in summer, infringes the fundamental injunction that the head shall be kept cool. It is a natural inference that the sex which wears the closest fitting head-gear will suffer most as regards its hair. We can hardly hope to see men clothed as to their head in the desirable minutenesses of bonnets or such-like feminine airiness.

There are, fortunately, certain definite figures concerning the hotness of different varieties of men’s headgear, which were obtained in the summer of 1906. A doctor in Paris, who wore the ordinary top-hat with a thermometer inside it, found in the early morning, with a shade temperature of  $77^{\circ}$ , his thermometer registered  $90^{\circ}$  ; at noon, with the outer air at  $90^{\circ}$ , that hat showed  $108^{\circ}$  ; while in the even-

ing, with a cool breeze and a temperature of 68°, the heat inside his hat was indicated by 88°. It is hardly astonishing to hear that he read a paper to the Academy of Medicine concerning the inevitable ill-effects of hat-wearing in summer. Experiments were also conducted by a writer in one of the English magazines: he used different hats for only, however, a quarter of an hour each, and found that, under as nearly as possible the same conditions, while a Panama gave a temperature of 78° the silk hat showed 89° and a motor cap 98°. The moral is evident in an overheated scalp with engorged vessels, retarded evaporation, and accumulated sweat and oily secretion. No more favourable incubator for 'germs' could be supplied by a pathological laboratory, and to germs we are beginning to suspect much of baldness is due. Clearly the Panama is the most desirable of present hats for heat.

Cold is the other condition against which the head may require assistance, and the dry cold which the face can resist cannot—with proper training—prove dangerous to the scalp. Against rain only a shield to divert its passage from the head to the body is needed.

For the preservation of the hair to the longest time and in the best condition it is essential to consider the harmfulness of a custom which began with the need of protection from violence, was continued by a desire for distinction and ornamentation, which has developed a most unbeautiful series of coverings, and which has been proved over and over again to be deleterious.

The colour of hair is derived from special granules

of fatty composition contained in the deeper layers of the bark and in the pith of the hair. The colour scheme is assisted by the distribution of vacuoles in the cells of these parts. Complete greyness means that all the fatty material has been absorbed, and that the vacuoles have correspondingly increased in number. Degrees and kinds of greyness are accounted for by the sheen of the hair, its coarseness or the thickness of its cortex, the amount of pigment still left and the innumerable possibilities of arrangement and reflecting powers of the vacuoles. Metchnikoff states that greyness is due to the activity of certain devouring cells named by him from their powers 'chromophages.' In this phagocytic action we may have the explanation of the encroachments of old age in all parts of the body, since the natural function of these cells is to remove devitalized and foreign materials.

Greyness is an economic disadvantage, as is demonstrated by the activities of no less than forty thousand patent medicine makers and vendors in Great Britain alone. We are all familiar with the hair restorers of many fanciful designations. No hair stain or dye is harmless, but there are degrees of harmfulness, and the most undesirable of all hair dyes are those which depend for their action upon the metals lead and silver. Vegetable coloration—as obtained, for example, from walnut-juice—is the best, next comes sulphur. Henna is a plant product. The article bearing the name of 'Mrs. Allen's' contains acetate of lead and sulphur, as does the 'Mexican Hair Restorer.' Tatcho, in a different category altogether, is stated to depend for its action upon

purified oil of paraffin. Paraffin is of value to the hair by its antiseptic vapour and slight greasiness, but ladies require to be particularly warned of the great danger of drying their paraffin soaked hair before a fire.

Professor Imbert, of Montpellier, has recovered the pigment of his hair, which had all completely disappeared twelve years ago, and he attributes the recovery to the X-rays. He is confirmed in this view by Professor Ullman of Vienna.

Thorough washing of the head need not be done, in the case of men, more than once a week : in this is not included the cold splash which will accompany the use of the morning tub in those who take it. Wetting of the hair daily will necessitate the replacement of the natural oil by a little brilliantine or pure olive oil. The present fashion of wearing the hair so short is a natural sequence of the wearing of unnecessary hats and caps ; but this shortness, combined with the ridiculous hardness of the 'military' brushes affected by men, results in a most harmful irritation of the scalp, and the same applies to the machine brush, which is at best useless to a normal head. The vigorous scrubbing with a rough towel is a matutinal indulgence which only men possessed of a most vigorous growth of hair can afford to indulge in, and the same applies to a daily wetting accompanying the cold bath, since the natural oiliness of the hair cannot be removed with impunity. The stimulation afforded by soft brushing is, on the other hand, definitely beneficial. Hard brushing is no preventive of dandruff, but will merely aggravate the condition by undue destruction of the superficial skin cells which as noted are 'dead' ; that dandruff

is present at all indicates something amiss with the skin of the head. The scalp, like the skin elsewhere, secretes in the normal state that amount of oil which is necessary to keep it in good condition ; if there is any superfluity, it is, or ought to be, absorbed by the superficial cells ; if so much remains that it solidifies and forms a dry or solid 'scurf,' treatment is required. 'Dandruff,' or 'seborrhœa of the scalp,' is responsible for much loss of hair, and also lies at the root of many skin affections of an eczematous nature. It is best avoided by following the usual rules of health, wearing suitable headgear or none at all, keeping the scalp clean on the same lines as are indicated in the discussion of the skin, and by noting that the irritation of hard brushes can do no good. The dry shampoo with strong ammoniated solutions is excellent as an occasional stimulus, and the rubbing in of a little pure brilliantine will do no harm if it is not allowed to reach the skin, which in a healthy individual does not require it. Singeing is said to prevent the hair from 'bleeding,' but it does nothing of the kind, for there is no escape of fluid when the hair is cut.

Dandruff is best removed by a thorough weekly lathering with soap spirit till it has been removed.

In women the question is complicated by the length of the hair. Brushing in their case must not be done with force, for it produces tangling and tearing of the hair. There is, however, nothing to add to ordinary hygienic principles.

Borrowed tresses are much used nowadays. The dark-hued tresses come from the south of France, and the fairer tints from Germany and Austria chiefly, but even here it is exceptional that they

should exceed thirty inches in length, and their value per lb. above eighteen inches rises in almost geometrical ratio for each inch. Transformations, wigs, and the other gentler synonyms indicate that even comparative hatlessness is insufficient to prevent baldness in ladies : it occurs, however, much less frequently and to a less extent in their case. Any of these 'transformations,' etc., requires attention to cleanliness as does the natural hair : hair-pads are dirty in the extreme. Hair-pins should be rounded at the point and not sharp—they also require cleaning or frequent renewal.

While women benefit by the lightness of their headgear, it must be admitted that they themselves do their best to neutralise the good effects by the insane crimpings and curlings, the forcible twistings impacted for eight or nine hours—the whole of their sleeping time—and the 'waving' and other effects, for the attainment of which hot irons are necessary.

Pope wrote :

'Your locks in paper durance bound ?  
For this with torturing irons wreathed around ?  
For this with fillets strained your tender head ?  
And bravely bore the double loads of lead ?'

That is treatment which no living tissue is able to endure with impunity, and hair is a living tissue. In loose coiling by day, and such arrangements which these coils permit, with loose plaiting by night, lies the proper treatment of what may still be woman's glory. If the hair has not that becoming spirality of growth which produces curling, it is very much the best to leave well alone ; notwithstanding Metchnikoff's

theory that ironing the hair with an ordinary flat-iron at a temperature of  $140^{\circ}$  is destructive to the chromophages which cause greyness.

The comb save for cleanliness had better never be used : brushing, of which the comparative slowness is an advantage, will amply meet all other requirements. Pediculi and their kindred justify the retention of the small-toothed article ; any other is merely a toilet superfluity and actual danger : the healthy scalp will not tolerate scraping by a bone, horn, ivory, or other hard implement, and the tugging to which the comb tempts when kinks or knots are encountered cannot but result in the dragging out or breaking of the hair.

Cleanliness is a *sine qua non* in the case of the hair as well as in every other tissue of the body. Like every other process which has this end in view, brushing is called for every night, and a hard brush is not to be used. Care will be stultified if the brush itself is not clean. Women, who have a more sensible habit in coverings and who wear their hair long, will find a three-weekly wash the most that is required. The water used should be soft, or at least boiled, and a comb is unnecessary. Various preparations are recommended to facilitate washing, and possibly the best is a beaten up raw egg mixture, but none is essential, superfatted soap is quite sufficient. Thorough drying of a woman's hair before she coils it or plaits it for bed is an evident precaution, if neuralgia, apart from any harm to the hair, is to be avoided.

Moustache or whiskers may or may not be ornamental. They are scarcely useful, and the moustache

is liable to food and other contamination. The waxed moustache, though possibly it was not designed with this end in view, nor even for the purpose which the lady in Kipling's 'With any Amazement' found so laudable, has the advantage of removing these hairs from the area of eating operations. A beard will protect the important facial and inferior dental nerves, and also, to some extent, the throat. Apart from this possession of these appendages must be justified by extreme cleanliness. It is very certain that the man who shaves cannot hope to maintain the pristine softness of his facial skin nor the tints of youth. There are risks in submitting to be shaved by the professional barber, for any carelessness on his part in carrying out the strictest cleanliness may lead to the spread of 'barber's itch' or 'rash,' a skin infection due to inoculation of the hair follicles with a fungus carried from person to person by dirty shaving implements.

Other hairs there are, which are admittedly superfluous, the commonest being the hirsute junction between the eye-brows, and, in brunettes especially, an occasional incipient moustache. Superficial destruction of such encumbrances is of course of merely temporary avail, so that the destructive action of such pastes as sulphide of barium seldom satisfies. The action of a drug like acetate of thallium, while it undoubtedly removes the hair in its entirety, is quite liable to leave the unfortunate user devoid of every hair of the body. In electrolysis is a slow but an absolutely certain cure when the treatment is carried out by a trained and skilful operator.

## CHAPTER VIII

### THE TEETH

WHILE man no longer requires a mechanism of the strength and sharpness necessary to tear food from the living animal, and as little the crunching ability of gorilla or ruminant, it is still necessary for him to observe that every creature of his order receives from nature two complete and perfect sets of teeth, and that only by the satisfactory preservation of these instruments can he hope to preserve a healthy digestion and with a wholesome sense of well-being. Bad teeth are a prolific source of illness and disease. Dr. Savill has held it responsible for the spread of neurasthenia in modern life.

Dental caries is the technical name for bad teeth ; it is the condition responsible for that horrible foetor of the breath which can only be compared with the emanations from faulty drains.

Apart from the odour, the absorption of the poisons from billions of flourishing bacilli will inevitably predispose to defective digestion from which, by reason of imperfect mastication, such people are also bound to suffer.

Mr. Chance dated the beginnings of dental troubles as far back as intra-uterine life, but we are compelled to begin our investigations with the epoch of ordinary birth, a period which is itself considerably in advance

of the time at which the average parent considers the child's teeth.

In the new-born infant the bones of the palate and jaws are soft, flexible, and incompletely united, and extremely susceptible to pressure; deep in these soft tissues are the germs from which the future teeth develop. In a normal child the first tooth, usually one of the front cutting teeth (incisor) of the lower jaw, appears, about the sixth month; but, as the 'cutting' is only the culmination of a lengthy development, it is evident why the teeth should be cared for before this event. In hand-fed children the first object to be put into the infant's mouth—if it is not a 'dummy'—is the teat of its feeding-bottle, and this teat corresponds neither in size, shape, nor resilience to the teat of the mother's breast; nor is the method by which the milk is obtained similar. The milk almost runs from the breast, and the amount of suction required is exceedingly slight. On the other hand, the force required to draw milk through the teat of a bottle is considerable. It will be found that the force needed to empty an ordinary 'feed' is quite sufficient to make the jaws of any adult ache. Perhaps it is imagined that the infant is specially endowed with the faculty of suction. But this is not true. What is true is that the child has to suck or die.

A child at the breast obtains its nourishment by a simple vertical movement of its lower jaw; a child on the bottle has to pull vigorously with indrawn cheeks. The position of the tongue is also different in the artificial feeding, so it is evident that there must be pressure upwards into the palate inside the mouth from the tongue and teat which will tend to arch

the palate, while the pressure of the air on the cheeks, transmitted to the upper jaw, will bend the alveolar processes towards the middle line, and so increase the deformity. [Dr. Hedley was able to show casts of all the stages of the process.] The pressure upwards, too, in the middle line would naturally throw forward and otherwise alter the incisor teeth, and to this action is possibly due the opinion entertained, or at one time professed, by various continental friends that all Englishwomen had prominent jutting front teeth! The developing teeth will be irritated, unequally stimulated, and become consequently uneven, while the developing jaw will become deformed and cramped.

What has been written of the teat applies verbatim to the comforter.

The remedy is obvious in default of a satisfactory working model of the human breast or of a readily flowing bottle: the child should be fed from spoon or pap-bowl till it is old enough to drink from a feeding-cup.

Teething should be painless, but hand-feeding is so common that it is hardly surprising to hear that pain and distress is an almost expected accompaniment. The truth is that as a result of the use of the rubber teat or comforter the gums of most of the unfortunate infants are in a condition of chronic irritation: the points at which teeth emerge are situations of rapid absorptive processes, and peculiarly open to bacterial invasion; the micro-organisms are on the spot, so acute inflammation readily ensues.

The relief in bad cases by lancing means the destruction of the delicate membrane of Nasmyth,

which covers the enamel of the crown ; so that the edge of the tooth when it is cut shows irregularities, which are in themselves ugly, and dangerous because they indicate that the structure of the tooth is defective.

When it comes to be a choice—as occasionally happens—between lancing and convulsions, then the former must be adopted, but not before a dose or two of Grey powders or bromide has been tried. Trouble with teething is clear proof that the child is not as it ought to be.

The first set or ‘ milk teeth ’ are all erupted within eighteen months or two years after the first incisor has appeared. These teeth must be attended to as carefully as the permanent set. Attention should begin with the first tooth to appear, and consists in wiping the tooth and mouth with a soft rag dipped in a weak solution of bicarbonate of soda ; a tea-spoonful of the salt dissolved in a tumbler full of warm water makes an efficient wash. This should be used after each meal, and particularly before putting the child to lie, for when the mouth is shut and at rest during sleep bacteria grow with facility. As soon as the child can understand, it should be educated in the use of a tooth-brush.

Decay in the teeth of a child requires prompt attention. The stopping of teeth is of advantage as a preventive of toothache and indigestion. Decay and too early removal of the milk teeth has harmful effects upon the growth of the permanent teeth which succeed.

The dental formula of a child is 2-1-2, meaning that in the half of each jaw there are two incisors, one

canine, and two molars ; that for a complete permanent set is 2-1-2-3, meaning in the half of each jaw two incisors, one canine, two bicuspids, and three molars. First of the permanent teeth to appear are the first true molars about the sixth year, and last are the third molars or wisdom teeth about the eighteenth year, though in many people these never form, frequently from want of room in the cramped and deformed jaw.

The enamel to which teeth owe their beauty is the only part which should be visible, and upon the enamel depends the life of the tooth, since by its stony hardness is protected the softer dentine or ivory and the deeper cavity of the tooth, with its sensitive and vascular pulp. Enamel is thickest at those places where most hardness is required, and thins off towards the 'neck' at the gum ; at this neck also is thinnest the bony cement which fixes the tooth in the jaw, so that at the gum will be the most vulnerable part. At this point will be the attack of micro-organisms deposited by the food. Helping to protect the neck is a very delicate extension of the mucous membrane of the gum, and it is important not to damage it by toothpick or waxed thread.

Enamel contains two per cent. of organic material and cannot nourish bacteria. But the bacteria growing in the food left in the crevices between the teeth, or in the tartar that accumulates about their roots, produce acid substances which can dissolve away the hardest and best enamel, particularly where it is thin, as at the neck of the tooth. When the covering enamel is eaten away the bacteria gain entry

to the softer dentine, where they can live and thrive, so that decay proceeds with increasing celerity.

Keep the teeth clear of both food and tartar. The latter consists of lime and other salts deposited from the food, with mucus and cells from the mouth and a considerable number of bacilli—the whole forming a firm and extremely obnoxious jelly. To it is due the almost stony formation which has occasionally to be scaled. While enamel is intact the tooth is safe, and the secretions of the mouth are alkaline and antagonistic to the lactic and other acids formed by bacilli. Hence the force of regular employment of alkaline washes and tooth-powders, though it would be better to prevent the formation of acids, so that antiseptics would seem to be indicated. But better still is the prevention of their access by cleaning the mouth and teeth every time after food has been taken, as well as morning and night.

People who take the trouble outlined above will rarely or never need any powerful tooth cleanser, and their needs will be fully met by ordinary soap. Not every one, however, can bear the lather of soap in the mouth, and these may use any good preparation of powdered chalk or pumice stone and soap powder, perfumed or flavoured. Soap is the main-stay of the most satisfactory tooth-powders; it is immaterial what harder powder is used with it so long as not hard enough to scratch the enamel, though sufficiently abrasive to remove food and other particles.

Tooth-brushes need to be of good quality to avoid unpleasant deposit of bristles in the mouth, and the

face of the brush made so that it may readily pass well in between the teeth. The best size is a child's brush, for this will pass easily between the back teeth and the cheek. The ideal course is for every one, including every child after its first tooth is cut, to see the dentist once every six months.

Gold stoppings were used far back in the ten thousand years of the era of Egyptian civilization. The material of such stoppings, whether of gold or oxyphosphate of zinc or the cunning insertion of tiny bits of porcelain, is the affair of the dentist.

It is better to keep one's own teeth than to let them require stopping ; it is better to have them stopped than to have them extracted. But there are cases in which false teeth have to be employed, and these teeth also have to be cared for. They need nightly removal and keeping in a slightly alkaline solution and as careful brushing as their natural predecessors. That thin edging of whiteness that forms along plates consists of tartar, and where any of the natural teeth remain in contact with this edge the 'cutting,' in of the plate is due to the solvent action of the acid-forming bacilli contained in the tartar.

The relations of the opposing teeth in the two jaws to each other is of interest. One upper tooth does not oppose only one lower tooth, but is placed so as to bite against the halves of two. As a result when a tooth is lost, its homologue in the opposite jaw does not lose its usefulness, nor will it consequently become loose and drop out. Dropping out is a tendency in teeth which are not sufficiently employed in biting. The toughness of the food of savages it is which not only keeps their teeth clean by friction

but which strengthens them by the proper stimulation of their roots. See, therefore, that the children have occasional tooth-drill on such materials as apples, crisp or hard biscuits, radishes, and so forth, and see that the adult maintains the habit. Soft feeding is destructive to the teeth.

Gum-boils, alveolar abscesses, etc., will not trouble the reader who keeps his teeth clean. Toothache is due to the undue stimulation of dental nerves, usually by acid fermentation. The old-fashioned loose plugging with soap of a hole in an aching tooth is often successful in securing temporary relief in that the alkali of the soap neutralizes the acid in the hole.

The value of mastication is manifold. First, it secures a thorough division and tearing up of the food particles. Next it secures a good flow of saliva and the mixing of the saliva with the food. Lastly, when these two are secured the food in the warmth of the stomach begins to be digested by the salivary ferments even before the gastric juice is secreted. The teeth should be given their full share in assisting such digestion, and the first food of a meal must not be of such a consistency or moistness that their province can be ignored. Dry bread that must be chewed is the best beginning for a meal ; best for the teeth and best because it provokes by its own properties the most active and efficient flow of saliva. The teeth must be properly exercised. As a side issue it may be observed that much less food is consumed when careful chewing is enforced.

Sweet breath is always desirable. What is more unpleasant than converse with a person whose breath

is evil-smelling. The more vigorous the speech of the person the more dreadful is the experience, for with each explosive utterance he showers upon us the offensive germs that abound in his saliva. No one would knowingly spit upon a friend, but unwittingly many do this same thing.

## CHAPTER IX

### THE FEET AND HANDS

IN his autobiography Spencer asks, among other questions valuable for their suggestiveness, 'What is the difference between walking and running?' Apart from the length of the stride, which is not a fundamental feature, since the action of running may readily be counterfeited and the progression made be actually nil, the chief difference lies in the muscular agencies employed and in the part of the foot that first meets the ground, also in the fact that both feet are off the ground simultaneously in running.

In standing, both front and back of the sole bear the weight in walking, the heel first receives the weight; and in running, the ball of the foot must sustain the early part of the strain. In normal walking we use to the full the pendulum-like swing of the legs and make the heel the first place of ground contact. It is the mechanical swinging movement of natural walking with which faults in foot-wear will interfere. Walking which brings the front part of the foot earliest to the ground involves great muscular effort.

By far the greater support of the erect body is intended to originate at the foot of a vertical line raised from the heel, and the remainder of the human foot which forms the supporting arch has the function

of a flying buttress, whose function is subsidiary, save in positions of relaxation or fatigue.

To preserve the upright position and to have the weight supported mainly by the heels requires a well-braced muscular body.

For this reason low-heeled boots are the best : the heel and sole of a boot ought to be of nearly the same depth. With each thickness added to the heel, the line of support of the body is thrown forward.

The inner edge of boot or shoe ought to be a straight line, not an angle with its apex at the side of the ball of the great toe. With the angle directed as it is in the majority of boots, the deformity caused is actually increased by the tendons, so that a corn or a still more grievous bunion may form which, once well started, is almost incurable. Where the narrowness is excessive, the foot may be so crushed as to cause the toes to overlap, and if the boot is short as well as narrow, the second toe will double upon itself in an upward direction, with the formation of 'hammer' or 'trigger' toe. The longest part of a foot is on the line which connects heel and the tip of the second toe, so that the point of a shoe—if point there must be—would naturally fall on this line. Too tight boots may also cause ingrowing toe-nail, a particularly painful deformity : another factor in producing this is cutting the nails badly. It is probably safest to cut the nails square across at the top and not to round off the angles. Corns can be accounted for by badly fitting boots.

Chilblains are almost the sole common foot defect which is not directly due to boots. Faulty circulation, with badly reacting skin and exposure

to cold followed by heating before the fire, are at the root of this mischief, and they resemble similar occurrences upon the hands. Where tight boots are partly responsible, these must, of course, be remedied.

Flat foot is a deformity due to the falling in of the natural arch of the foot. This arch is made up by the bones with their connecting ligaments, and special ligaments of great power cross beneath it. It is also maintained in position by the action of tendons derived from several powerful muscles of the leg. Defects may be caused by want of muscular tone as well as by ligamentous failure. The beginnings of failure arise from excessive straining of the ligaments by continuous standing. Standing with the weight mostly supported by the heel could scarcely ever bring it about. Flat foot is of common occurrence amongst shop assistants (Mr. H. G. Wells has given the symptoms in his story of *Kipps*). Recent legislation which prescribes seats for their use will save them from the continuous strain. Thicker boots, with a better support to all parts of the foot, cold bathing of the feet, stimulating liniments, tiptoe exercises, and dancing are useful preventives. In bad cases there is frequently required a supporting arch in the boot. This may be made of cork or a steel spring, or it can be quite well obtained by the thickness of the leather forming the waist of the boot—at the sides as well as underneath. Good boots can only be made to measure; and measuring does not mean the use of the rule or tape alone. Of what avail to note the length of a foot from heel to toe, and to add to this the width of the foot at even

three different points? That gives no indication of thickness. The simplest, and undoubtedly the best, course would be to take a plaster cast of each foot, and upon such cast to build each boot. Such a cast would prevent a large amount of very real suffering.

The importance of keeping the feet warm is a commonplace of knowledge, but too hot, unventilated footwear is at once made evident by 'sweaty feet.' The polite term is the medical one of 'Hyperidrosis,' or in a still more pronounced olfactory stage 'Bromidrosis.' The bracing effects of daily cold water combined with the presence of a definitely absorbent material next the skin is usually sufficient; in special cases absorbent powder must be added, together with a daily bath of some such substance as weak formalin.

Blistering of the feet may sound a small matter, but it is sufficient to incapacitate an otherwise able-bodied soldier. There are certain small precautions which may help to keep the feet sound during a march, till the necessary hardening has occurred. The dictum regarding alcohol being of more use to the feet than the head well exemplifies this, for the astringent and hardening power of whisky on the skin is well known. Soaping the socks and boots is another time-worn device, while powder applied to the threatened areas is also valuable. The latter is useful also to stave off some of the pain of corns. Corns are a growth downward at special points of the horny material of the skin which invades the softer structures, and, reaching nerves, presses upon them, causing pain. Corns themselves, soft or hard, are caused by intermittent pressure and are best

removed by a ten per cent. solution of salicylic acid applied wet or painted on with collodion, and after one or more daily applications for the necessary softening to be accomplished, the work is consummated by the ordinary 'cutting.' Protection to a painful corn may well be afforded by a coating of absorbent powder or by a ring of soft felt with its orifice over the painful spot, to take off the irritating pressure of the boots. Corns are occasionally the starting-point of that form of cancer known as epithelioma, and even of senile gangrene in the elderly.

The ventilation of the feet is complicated by the prime necessity for attention to warmth, and by the universality of leather in bootmaking: the sandal, unfortunately, is not suited to the exigencies of the English climate, but if the idea be once accepted that leather is, after all, not a *sine qua non* for covering the feet, it should not be difficult to discover a material which can at the same time maintain warmth, throw off water, and yet allow of ventilation. An artifice of the nature of feathers or fur in the animal world would seem to be suggested, and there is little doubt that a suitable material would soon appear if the present unworthy and childish horror of wearing boots 'too big' were to disappear. Shoes at present are preferable on the score of ventilation, and also in some instances for making the ankle depend upon its own capabilities. Laced boots are no more necessary to most of us than are corsets. Where strain must be excessive, as in mountaineering or skating, there is nothing to be said against boots, or where protection against cold,

wet, or such impedimenta as jungle or brushwood is required; but for most occupations and even games the ankle should be permitted to do its own work.

### *The Hands*

As the special seat of delicate tactile impressions, the finger-tips will require particular attention in the way of warmth, since the speed of nerve impulses diminishes definitely when the nerves transmitting them are 'cold,' and the delicate muscles of the fingers and hand will be correspondingly sluggish.

Cold hands, while arising partly from their distance from the central supply of fully oxygenated blood, are due chiefly to special conditions in the hands themselves. One of these suggests itself at once, viz. the exposure and amount of passive movement to which they are subjected; but a very definite contributory is the large amount of joint and bony areas which are included in the region of the hand. In such areas active metabolism is at a considerably lower level than in muscles, and so it arises that joints are to a large extent dependent for heat upon their surroundings. Here is one reason why joints are specially liable to chills and diseases, and also one refutation of that garb which would leave children with their knees bare. The commonest sequel of 'joint colds' is rheumatism. Exercise is the best corrective, with gloves as a natural accessory to obviate the effects of exposure.

Gloves designed for purposes of warmth should possess the internal absorptive layer which is elsewhere insisted upon as the healthiest contact for

the skin. There are few people so fortunate that they can afford to discard a pair of gloves after a few days' wear, and most choose them for durability. That being so, there is no other way of ensuring even moderate cleanliness than by using washable materials.

For warm weather the impervious hand-covering that is usually worn is undesirable in every way, for either ventilation, actual cleanliness, or comfort. Such material, then, as leather or kid in its various forms, suède, reindeer, and so on, are naturally excluded, and the most sensible fabric will be of fine-meshed construction, which can now be made in silk or wool as much as in cotton. Ordinary impervious silk is only a degree less undesirable than kid.

For unpleasantly clammy hands hot water is more efficacious than cold, since the effect in contracting vessels is much more lasting with the former, a fact taken advantage of by the surgeon in restricting haemorrhage. For actual hyperidrosis, or sweating between the fingers, astringent washes, such as a two per cent. solution of formalin, and bland dusting powder are needed.

Effective drying of the hands after every washing is always to be insisted upon ; harsh skin is likely to be the penalty in even warm weather, and in cold chapped hands and chilblains are the penalties.

Freckles (little pigmented spots) are the natural attempt on the part of the skin to screen and prevent harm from sunlight to underlying structures ; their prevention will suggest itself in gloves or other means of shading. A hint may be taken from the colour

of the freckles as to the tint of parasol ; and accordingly the brownish reds and yellows are found to be most valuable in shading from the sun.

Cleanliness of the hands should have special reference to meals, and in such cleanliness the nails must be most scrupulously included. The nail is formed of very much the same material as the hair. It has long been known that severe illness can cause an interruption of the nail growth which will appear upon it as a transverse furrow. Longitudinal grooving suggests a gouty or rheumatic diathesis, but the white opacities occasionally apparent are of the same nature as the greyness of hair, being due to vacuoles in the horny cells. The much-desired lunula, the manifestation of which counts for so much to the dilettante, indicates the growing part from which much of the nail is formed ; but share also is taken in growth in the direction of thickness and width by the nail folds, which should not therefore be unduly maltreated in the nail toilette.

## CHAPTER X

### LIGHT AND OZONE

WISE old Sir Isaac Newton with his crystal prism was the first who began to understand the sources of our energy through light. He analysed it into those colours so familiar in the miracle of the rainbow.

Light is necessary to a full life, but recently it has been found that in light a cure for threatened life can be obtained. Finsen picked out the blue from the spectrum ; he sent it through his cooled and complex prisms to attack one of the foulest diseases that ever gnawed the human front. That was the cure of lupus, the logical sequence of an observation that the germs of consumption were killed by sunlight in four minutes. This action of sunlight upon the micro-organism of lupus and phthisis is typical of what sunlight will do for humanity if man himself will not interfere with its work.

In the germicidal power of day is sufficient appeal to man that he should not shun the light.

The experiments of Clayton with beans grown in sunlight and in shade show with extraordinary force the effect upon not only the individual but upon posterity. The shaded beans and pods when gathered were less than a third of the weight of those grown with no protection from the sun. From the

seed of these next year, the offspring of the shaded weighed only two-thirds of the others, notwithstanding that all were being grown in similar conditions and in sunlight. In the fourth year from the experiment the plants derived from the shady ancestry, though they produced flowers, failed to produce fruit—that is to say there was a failure to perpetuate, and, consequently, an extinction, caused by the deprivation of sunlight from the one generation. That is a lesson which is easily read.

M. Flammarion enclosed plants of the same species, age, and size in separate boxes of blue, red, and ordinary glass and examined them at the end of three months. Those plants completely bathed in blue light had not grown at all ; those in the ordinary glass subjected to simple daylight had grown very considerably, but the red box had suited its occupants so well that they had increased fifteen times. Ordinary daylight, of course, contains red, blue, and green rays, and the red, as shown, is very favourable to growth, but the blue in it, as suggested by the blue box, had retarded its action.

It should be stated that, though the spectrum obtained from sunlight by means of a crystal prism or in a rainbow contains practically an octave of colour, these may all be resolved into the primaries of red, blue, and green. The last perceptible violet tint of the spectrum represents a vibration speed of twice the number of the first visible red. This is the only octave of the sun's rays that the human eye is trained to register, but it as little represents all the rays derived from the sun as the historical life of man represents the story of the world. These

rays travel at a pace that would take them more than seven times round the world in a second, and the point from which they emerge is more than ninety millions of miles away from us.

Beyond the violet lie the powerful chemical or actinic rays, and far beyond them still the wonderful X-rays, while in the depths below the red quiver the cause of heat.

The blue and ultraviolet rays account for the most vigorous chemical action, as shown by freckles, sunburn, and the death of bacteria ; but the range of action of these is very superficial, being, in fact, confined to the skin, since they are not able to penetrate blood, however near to the surface. The other rays, increasing in length towards the red end, are less potent but have a greater range, though even they cannot be proved to penetrate any great depth in the body. The fact remains that complete sun-baths of naked patients, with due precautions against exposure, such as are practised at Veldes in Austria, have been proved to be definitely beneficial.

Turn a slum child into the country for a day, and at the end of the golden day the tinge of red on the sallow cheek is due to more than a mere sunburn. The child's blood is actually redder and there is more of it. That has been proved by the vicarious testimony of sundry unfortunate rabbits.

The investigations of Platen prove the invigorating power of sun rays. He found that young dogs with eyes shielded took up sixteen per cent. less oxygen than when their eyes were free. As a converse to this, it is now clear why the instinct of the badly wounded is to creep away from the light, for, in

addition to hiding from possible foes, the available store of energy is less rapidly reduced in the darkness, and life so prolonged to the uttermost.

For practical purposes it is immaterial whether sunshine kills the germs of consumption by penetrative action or by the stimulation it affords to the energy of the body. The immense gain in the sense of well-being caused by a proper amount of sunlight has been experienced by all. Arctic explorers have described the effect of the first view of the sun as a veritable resurrection, and to them the ancient sun-worship becomes more than intelligible.

On this matter of the energy-stimulating power of light rays, Nordau in his *Degeneration* suggests that there is a peculiar compelling force in certain tints of red, and that the appeal in this colour is to certain primary instincts which have their outlet in violence. He instances as of this 'dynamogenous' nature the red of the soldier's coat of a passing day, which incites the spectator towards the 'glorious' idea of killing his neighbour. In the same connection is the peculiar effect of a red rag on a bull; the 'seeing red' of men blind with rage; and the colour of blood itself, which, while it sickens those of one nervous temperament with horror, has a bestial influence in inspiring ferocity in others.

The promoter of energy of all kinds, and the destroyer of forms of life inimical to man must gain free admission to our homes. This means that there shall be the greatest possible window space, and a lesser stultifying of it, when provided, by the use of window-blinds and curtains. It also means getting into the fresh air at every opportunity.

No electric baths or ozone baths will replace, at whatever expense, that which is at our call for nothing. Nature seems to have made her one great mistake in storing up the energy of bygone days of blinding sunshine in the coal seams of to-day, so that now by our coal fires and their resultant fogs the light of the past is actually able to obscure the light of the present. Mists we cannot as yet avoid ; fogs, however, are preventible, and why are they not prevented ? The reply is precisely the reply to the same question regarding consumption. It is due to man's folly. The prevention of fogs is principally a matter of efficient fuel consumption, and grates and furnaces to this end are quite attainable.

There are still rows of houses built so that the sun cannot reach the ground between them, houses with deficient window area, and houses with the worst chosen frontage as regards the sun. And this is so much the worse seeing that so many people must needs be indoors at their work.

Light and life being both ethereal ripples, it is not strange that there should be action and interaction between the crowding arrivals at the body from the sun and those already playing their part in the meshes of the body, for, like all energy, these require renewal. By the renewal of this energy is obtained the fuller bound of the pulse and a deepening hue of the blood, and on these are readily built a truer bodily welfare. We are children of the sun ; and, while there is no effective worship possible to such moderns as ourselves, there is yet an effective punishment of those who fail to do the necessary honour.

*Ozone Baths*

By some people sunlight and 'ozone' are supposed to be of the same class and of a similar importance; so we find 'ozone baths' at the more famous health resorts. Ozone is credited with producing that health which best flourishes at the seaside, in the mountains, and such other places, and the inference is promptly drawn that if a small quantity of a substance is good there must necessarily be more virtue in a greater amount.

Air is excellent as we obtain it in nature; it is by no means excellent to inhale it at twice the atmospheric pressure—as any caisson worker or diver will assure you. Nor is it any advantage to have the oxygen, which forms one-fifth of the atmosphere, in much greater quantity than this; far less to be compelled to exist in pure oxygen, which is toxic. Ozone, however (unlike air or oxygen), is valueless to the body in any quantity whatever.

From its very paucity ozone can be of little use; but, on account of its possessing great oxidizing power, it can never pass beyond the mucous surfaces of the lung tubes, even should it reach them. The fact that ozone is in the air, however, proves that there is little deleterious matter of organic nature, and its presence is of value to that extent. Ozone, if it has any power of affecting respiration at all, does so indirectly and in the same fashion as the pleasing odours of flowers. When either of these is present the stimulation of various nerves makes one desirous of inhaling the cause of the scent more deeply, and, con-

sequently, deeper breaths of air with its contained oxygen are occasioned. Here is one reason, at least, why a favourite site for sanatoria is in the vicinity of pine forests. It is interesting to observe that the Grassois, who make the chief part of the world's natural perfumes, have an average life of over seventy years.

## CHAPTER XI

### THE EYES

**I**F the eye notified its own ailments as readily as might be expected, life would be much simpler. For there is no closer interdependence than that existing between fitness and the state of the eyesight.

Jaundice usually registers its presence by the typical yellow tint of the mucous membrane covering the under lid and the proximate part of the white of the eye. Anæmia may be as readily seen. In Bright's disease frequently the first warning comes from the puffiness of the lids in the morning ; and for centuries the pearly white or blue of the eye of the consumptive patient has been remarkable. There are diseases in which the diagnosis may be dependent upon what is found after examination of the interior of the eye and retina. The discovery of chronic kidney trouble is often first made by the oculist, while the fiat as to such grave conditions as general paralysis, locomotor ataxia, and general tuberculosis is sometimes obtainable only from what the eye reveals. That apoplexy, or opium and belladonna poisonings, may be shown in a mere glimpse of the pupils is a commonplace of knowledge. The greatest curse of modern visual life, astigmatism, gives no external evidence of its presence, however, nor could one predict in the majority of cases that any given person from his appearance must be long or short-sighted.

Yet these defects are of as great importance as anaemia or jaundice, which are conspicuous to every one.

The commonest result of an uncared-for eye strain is derangement of the digestion, with stomach and liver troubles. The writer knows this to his cost, since for years he underwent intervals of torture from atrocious sick headaches, which cleared up completely when proper spectacles had been prescribed. The megrims, gouty headaches, and so on are phrases which conceal ignorance, and the eyes should always be suspect in doubtful cases.

Many a bright child is being spurred beyond the capacity of its eyesight, with resultant 'biliaryness,' moodiness, and lethargy, or with unaccountable outbursts of temper exacted from it by the strain. It is not suggested that the eyes account for every case of 'unfitness,' but the part played by them in this is a very large one. The facts are before us as to the large proportion of the population that is so afflicted.

At the meeting of the British Medical Association in Toronto, 1906, the following statements were made. Of six hundred thousand children examined in London, ten per cent. were found to have less than one-third of normal vision. In Germany Cohn finds that twenty-two per cent. of the lower classes are short-sighted or myopic, while fifty-eight per cent. of the upper classes are similarly afflicted. To turn to a third country, it is found that while the same conditions exist generally throughout America, in one school in Philadelphia two-thirds of the children had defective vision.

A fact that should be again emphasized is the infrequency with which the defect is suspected by

either the sufferer or his relatives. So here is valid argument for the great value of the early school inspection of all children's eyes, that the aid of glasses may be invoked at once.

The demand made upon it by the very acute modern development of town life is severe. Nature built an eye primarily for distant vision: man has required that it should be used almost exclusively for objects at a range of inches. Thence the 'dis-harmony' and the increase of need of artificial aids.

The eye is so complex that failure is not surprising. Two translucent solid bodies, the cornea and lens, with two transparent chambers filled with fluid or semi-fluid, are the media through which light must pass before the sensitive retina is reached. Nine muscles with their nerves concern themselves with the direction and amount of the light which is to be admitted. An optic nerve takes up the message and by devious paths transmits this to both sides of the brain. Multiply this statement by two, since most of us are fortunately binocular, and we begin to understand that since failure in any single part will cause mischief there are here considerable possibilities. Add the necessary pigment for the iris and the elaborate additional precautions for guarding the eye—which exist in every one and any lapse in which is liable to cause trouble—eyebrows, lashes, lids, glands, canals, and the complication begins almost to simulate confusion. Defect anywhere may evidently lead to chaos. In our own day, the universal spread of the printed page has made the most minute attention compulsory. This is, in short, an age of black and white at the shortest possible range. The

test of modern fitness is the ability to use black marks on a white ground, either by reading or writing them.

Of the muscles concerned in the more minute movements of the eye machinery, one alone has to bear the strain of accommodation or focusing. It is by means of this ciliary muscle that the amount of convexity of the lens is altered so that the image focused shall fall always at the same distance, on the retina, though the rays from the object gazed at be parallel, as in the case of a distant object, or widely divergent, as occurs when anything near at hand is perceived. The muscle of accommodation is accompanied in its action by contractions and dilatations of the pupil, in order that images may be the clearest possible by the cutting off or letting in of extra light, but most of the muscular work that has to be done in effecting clear vision is done by it. Upon it is thrown also the effort to correct any defects of the media through which the light reaches the back of the eye, by endeavours to adapt the shape of the lens to securing a regular retinal image. This muscle is always in action through the waking hours, a statement which applies to no other muscle of the body—not excepting the heart, for the heart has rest intervals. Incessant contraction of muscle is good for neither it, the sensitive nerves it contains, the brain which registers its incessant messages, nor the organism possessing the brain. In the young human being, with its softer tissues, it is clear that a constantly acting force is bound to cause deflections by the giving way of the materials acted upon and the expectation that the eye of the young will not stand this strain, a deduction borne out by facts.

To the excessive work thrown upon the eye in reading and near work must be added the fatigue induced by the spread of artificial illumination. There are naked lights everywhere—in the streets, in the theatres, in the churches, in our homes. A naked light is a bad light, whether taper, candle, gas, or electricity. All light should be diffuse. Add to faulty artificial lighting the glitter of jewels, orders, table crystal, mirrors, and silver, and the ‘society headache’ becomes explicable.

The value of restful colour schemes is now being perceived and acted upon in the home as well as in the country. The tint of a billiard table is not the least of its advantages. From one book to another is a very moderate relief; from a book to the garden or country is admirable. Golf for even the half-blind is the healthiest of pastimes, cricket being less excellent, as it demands more time of the eye to be spent on the ball.

Here, perhaps, is a not inappropriate place to consider the effect of smoking upon the eyesight.

Medical men are well aware that there is such a thing as tobacco blindness, and that it is due to a gradual heaping up in the body of the products from tobacco. The retina and optic nerve are the seat of the mischief. In the majority of cases the condition is curable by the complete cessation of smoking. Such blindness is due to careless excess in the quantity, in the strength of the tobacco used. Smoking on an empty stomach is particularly bad; and chewing is an outrage.

The care of the eyes should begin at the birth of the child. Proper cleansing of the eyes then by the doctor may save the eyes from a disastrous inflamma-

tion, one indeed that accounts for most of the blindness in children.

The eyesight should always be examined when the child is first sent to school, whether in its own nursery, kindergarten, or elsewhere.

The difference from year to year in a defective eye is very frequently worth correcting, whether of short or long sight, or astigmatism. And unless there is actual pain or burning in the eyes themselves there will be no suggestion, possibly not even headache, to direct attention to the source of a child's troubles. Puberty, adolescence, and the climacteric are times of special strain.

Nearly every one at forty-five begins to need convex lenses for reading, and this need ascends in a steady progression. At forty-five the lens is much less convex and translucent than at infancy.

Foreign bodies not infrequently get into the eye, dirt, grit, coal dust, and such like. It is therefore a desirable accomplishment to be able to evert the upper lid, since the foreign bodies are usually found clinging to its under surface. Where the irritation from any such cause is very intense it is always worth remembering that a single drop of castor oil will give considerable relief. For lime, alkali, or in fact any caustic which has reached the eye, this oil should be immediately used, or in its absence ordinary olive oil.

Some workmen are extraordinarily expert in removing 'fire' from the eye with a penknife, but for those who have not nerve for this proceeding, it may be remembered that the quaint method practised by our grandmothers of getting a friend to lick the surface of the eye is occasionally efficacious and is absolutely painless.

## CHAPTER XII

### THE EARS

WE have ample reason to believe that threatening sounds were heard upon the earth far in advance of sounds of invitation or friendship, and the 'fittest' in early times would be those who were able to hear the threatening advance of foes.

To respond to the mere crudities of menace a very primitive mechanism would suffice, and possibly the first 'hearing' vibrations were recorded by a very widely distributed sensitive apparatus. There gradually developed powers to register and understand, till finally there differentiated the human ear with a lesser power of noting intensities but an extraordinary ability to analyse complexes of sound.

As a result of the distracting sounds of civilization, it is certain that attention is more difficult to concentrate, that the brain in consequence cannot but suffer. Dr. Hyslop states that in early insanity auditory perversions are the most common, the first to appear and the longest to persist.

It is not possible to enumerate the sources of noise which may do harm. Motor-car and cycle with maddening hoot or rattle of explosions are but one of the terrors of the city; the buzz and rush of electric cars, the clatter of that anachronism the horse, and barbarously paved streets; the yell of the newsboy,

the yapping and barking of dogs ; the raucous voices of city-dwellers who have to make themselves heard ; whistles and bells, and such bells—trams, carts, ragmen, and churches ! Is there any reason for the deadly inhuman clamour of those bells which are intended to remind us of eternity, and which have hurled so many a tired soul prematurely into it ? Piano-organs ! They are actually sometimes a *relief*, and no confession which praises them could more utterly damn the alternative. As for railways, a strong protest against their methods of whistling and exhausting steam was made by the British Medical Association so long ago as 1890.

If insanity will not compel attention to the need of relief from the turbulence of town air, there is yet another fact to appeal to—the actual health and life of the children. The growth of infants is retarded by the noisy streets in which they live.

Since overuse of any part of the body leads to its inevitable weakening and destruction, there is a steady increase in deafness. No one can look forward to the approach of this infirmity without misgiving, yet without it he runs the risk of brain damage. There is no middle way. If to the number of men, women, and children definitely afflicted with deafness there be added those to whom the noise of towns is a perpetual irritation and lessener of efficiency, it is safe to say that the bulk of the town population would be included.

Every townsman has noticed the restlessness of the first night spent in the stillness of a country bedroom—a restlessness and sleeplessness caused by the lack of the accustomed irritant.

Damage to the brain by noise indicates that there is a deficiency in the mechanism by means of which we hear, for if a light becomes irritating the closing of the eyes will at least mitigate that nuisance and secure a temporary relief. We have no effective ear-lids.

Wool in the ears is an occasional relief though it carries its own dangers. The pathetic attempt of Carlyle to build a sound-proof chamber in his home at Chelsea is a model of the failures which have so far resulted from attempts to combat the evil from this side. The attack must be made on noise itself.

As with the eyes, the more specialised the sense, the more sensitive is the apparatus. A slight difference of degree or duration in the stimulation of eye or ear may lead to considerable mischief. In the eye it was found that this was largely traceable to default or damage of one small muscle, the ciliary muscle, and in hearing the tiny *stapedius* muscle of the middle ear has the chief brunt of endeavouring to neutralize harm.

Of the hearing apparatus all that is outwardly perceptible is the seemingly superfluous external ear. This is not quite so useless as it looks, for its indentations and irregularities are of use in localizing the direction of bounds. In man also is some remnant of the power to 'prick' his ears, for there are three muscles still attached to the external surface of each which it is still quite possible to bring into play by a little practice. That the outer ear is of value has been proved by leaving the orifice of the ear open, and filling the rest to one flatness by means of vaseline or a similar compound.

It is only after the curve of the external canal is

passed that the fundamental hearing machinery is displayed. A membrane or drum takes up the air vibrations and transmits them by a chain of three minute bones to a still smaller membrane. One of the bones is directly attached to this small membrane ; it is called the *stapes* and is pulled on by the *stapedius* muscle : it is concerned with tightening or relaxing the inner membrane. By pulling upon the membrane it can damp down the vibrations transmitted from the drum of the ear considerably, and thus ensure that too great an intensity of vibration shall not be transmitted.

When a loud sound is expected by the normal individual his *stapedius* muscle gets warning, and braces up the membrane to protect the sensitive auditory nerve. An unexpected loud sound, however, especially of high pitch, rushes straight to the unprotected nerve, and the cataclysm in the brain may result in permanent, though usually only temporary, deafness. But if neither results, evidently the brain cells to which the auditory nerve has promptly carried its blatant message have been unfairly treated, and results ensue to correspond. These may be read, *mutatis mutandis*, under what has already been written concerning vision.

The irritability of brain cells in the parts which have to deal with sounds, or the memories of sounds, is evidently likely to be a fruitful source of insomnia and all that this leads to, so that the genesis of auditory dreams, or voices, or supernatural verbal messages, is comparatively simple, and is readily explicable by the hyperæmia of overworked brain areas making these paths of conduction easy to those

impulses which arise during the disturbed and unrefreshing sleep of so many citizens.

The middle ear, which contains the little line of ossicles stretching from membrane to drum, communicates with the air by the Eustachian tube running to the back of the nose. The tube supplies air to the middle ear and maintains the balance of the drum. Failure of the air supply leads naturally to absorption of the air in the chamber and collapse of the drum inwards with resultant deafness.

An open Eustachian tube is necessary. Catarrh, such as arises in a common cold by extension to the nasal end of the tube, may block the tube and cause deafness.

Presumably every one has noticed the tendency to deafness in the first few days of the cold. It arises by a plugging up of the Eustachian tube by mucus which covers all the nasal surfaces at such times. It has been suggested that this coat of mucus prevents organisms in the nose from gaining access to the middle ear, and there possibly setting up abscess. It is on this account not wise by forcible blowing of the nose to remove the plug, since the mucus and the microbes may be driven into the tube. As the cold departs the mucous obstruction will naturally come away. But if such deafness persists for more than a week, treatment must be obtained, otherwise the air in the ear chamber will be absorbed, the drum forced in by the external air pressure, and the temporary deafness be rendered permanent.

Catarrhs, enlarged tonsils, adenoids, so common in children, make middle ear disease common among the children of hospital practice.

From the relationship between throat, nose, and ear is enforced the value of care of the mouth and its connections. The healthy child must sleep with its mouth closed; breathing with open mouth must be at once checked, for the mere passage of unwarmed air into the throat is sufficient to induce a catarrh. Fourteen in every hundred children at school are sufficiently deaf to interfere with their progress, and most of these are deaf because of neglect of common throat troubles. Of one thousand school children examined by Mr. Cheatle, four hundred and forty-nine were found to suffer from adenoids.

Wax in the ear, in the manner of obscure eye troubles, may cause a vicarious suffering such as giddiness or vomiting. This is on account of a slip of nerve derived from the *vagus*, the great nerve of supply to the trunk organs which reaches the ear. In obscure cases of sickness or giddiness this possibility should not be overlooked. The best softener of troublesome wax is ordinary baking soda, a tea-spoonful to a tumbler of warm water: a little of this dropped into the ears for several nights will sufficiently loosen the hard deposit for it to be removable by gentle syringing with the same fluid. Picking the ears for this purpose with a pin, hair-pin, or match is a most dangerous procedure.

### *Equilibration*

Closely associated with the organ of hearing, and innervated by the same nerve, is a separate mechanism composed of three semicircular canals arranged in three planes at right angles to each other. The

fluid in these canals communicates directly with that contained in the inner ear, and must therefore be susceptible of the same stimulation as that which is concerned in hearing. But the influence of this is very different. By the movement in or out of the fluid in any canal we obtain our sense of position in space, and the three combined serve us for equilibration.

From this apparatus for equilibration is probably derived the sensation which gives pleasure in dancing, on account of the rhythmic ebb and flow thus induced in the canals, and it is probable that seasickness is caused by the unaccustomed disturbance of the canals by the motion of the ship, a proposition that rules out of account most of the vaunted specifics for this disorder.

Those aerial waves which play upon the organ of hearing must also affect equilibration, and to this may be ascribed the giddiness frequently caused by too loud sounds. What is certain is that the canals help us in keeping a balance, and it is only reasonable to assume that what may damage the ear may also damage them.

## CHAPTER XIII

### THE NOSE

WHETHER or not the sense of smell is more of an advantage or a disadvantage to the dweller in cities where cats, dogs, horses, factories, and man himself is allowed to pollute the atmosphere need not be discussed.

To incessant auditory and visual stimuli must be added the persistent hail of noxious particles which assault the organ of smell. It is well known that each great city has its distinctive smell: a return to London after a few weeks' absence will rapidly convince any except the anosmic of this truth.

The actual nerves of smell are situated high up inside the nasal cavity, and the sensation of smell is produced by the actual contact of infinitesimal particles of the odorous substance to the sense membrane. That these odorous particles must be exceeding small is proved by an observation of Haller. He found that a morsel of paper impregnated with a particle of ambergris which could only be approximately represented by a fraction of which the numerator was 1 and the denominator 2,500,000,000 parts of a grain, maintained its distinctive perfume for forty years.

It is an extremely curious fact that those micro-organisms which are perceptible by the nose are

non-pathogenic, whilst the dangerous germs of cholera, small-pox, tuberculosis, and measles may be in the air without any nasal warning. The mucous membrane of the nose has been found to contain more than thirty varieties of bacilli, some of them, such as the different micro-organisms of suppuration, capable of developing a very rapid virulence.

The nerve filaments concerned with smell are derived from an outgrowth of the brain. From the intimate connection of smell with the brain arises the powers of association called into play by many odours: there is no more powerful stimulus to the recollection of scenes and other memories than scent.

On account of the quick connection between brain and nose the olfactory nerve would appear to have been selected among animals as an important aid to their preservation. The eye is, perhaps, quite the easiest sense-organ to deceive, a truth which is taken advantage of in the colouring of all the carnivora blending readily with their surroundings. But it is not possible for the sense of smell to be so deceived.

As a protective faculty for man, smell has greatly degenerated, though it will still give warning of escapes of such dangerous effluvia as coal-gas, emanations from drains, and so forth. There is a popular impression that a bad smell can cause sore throat and even diphtheria. We know this idea is incorrect, but there may possibly be an actual depressing effect produced by the evil odour.

The scent of flowers, of pine forests, and that odour supposed due to ozone induce the individual to take deeper breaths, that he may increase their agreeable

stimulation. In a different respect as an incentive to appetite and the secretion of the appropriate digestive fluids, odour, aroma, or bouquet have all their uses. Fortunately, too, it is still occasionally possible, despite the perverse devices of a dishonest age, to distinguish bad food by its smell.

In the nasal cavities lie a series of spongy bones covered by a thick velvety membrane full of blood-vessels, and covered with slimy mucus. These form a simple heating apparatus for all air which passes over them—hence one advantage and necessity of nose-breathing.

Air entering the nose impinges upon this warm moist surface so that most of the dust, dirt, and the microbes in the air are caught on the slimy surface. Air thus inspired will very evidently contain little impurity by the time it reaches the larynx and windpipe. Some of this collection of dirt is eliminated by using the pocket handkerchief; a proportion passes on to mingle with the mucous secretion of the back of the nose, and, aided by the current from the tear-ducts which open there, passes into the throat and finally reaches the gullet and the alimentary tract. Nature attends to a too irritating accumulation by causing sneezing, or an increased secretion of mucus, in nose ‘running.’ Blowing the nose vigorously should be one of the rites of health, and the time for practising it is the last thing at night and the first in the morning. This performance affects also the Eustachian tube, and reinflates the middle ear. Sneezing acts in the same way, and this is the sole excuse for a pinch of snuff.

Our present method of carefully wrapping up all

the detached nasal secretion, with its attendant bacilli, and of then placing them in the favourable warmth of a pocket, is abominable. It has been urged again and again that the linen or silk article should be replaced, if not by the free and easy methods of the beggar, by an article made of paper which could be at once destroyed. Dried tubercle bacilli are flourishing upon the handkerchiefs of one out of every six people in England, and one in every six of us succumbs to their attack. Paper handkerchiefs after the Japanese model are now obtainable in England. Scent on handkerchiefs, so objectionable to the average man, is yet antiseptic in so far as it contains volatile oils, and is to that degree tolerable.

In some people there is a hypersensitive state of nasal nerves as regards special odours. The irritating pollen from grass has given the name to 'hay fever,' but it may arise from the odour of special flowers or animals. In midsummer the little town of Grasse, in France, is subject to veritable epidemics of hay fever caused by the picking of orange-flowers.

## CHAPTER XIV

### POSITION

THE unborn child spends several months in a position that would lead one to expect a permanent modification of the bodily form of its after-life. Yet no deformity results, and any malformations of limbs, trunk, and head are due to other causes. The Indian papoose is strapped rigidly to its mother's back with no apparent harm resulting. The children of some lower classes are swathed tightly in numerous folds of a voluminous shawl and so carried for long periods ; yet, though an Englishman professed to discover in this the reason for any number of deformities perceived by him in the slum children of Glasgow, there is no sufficient evidence to prove his contention. Children are fastened into perambulators so that movement of the lower limbs is impossible, yet permanent harm is hard to discover. These forces do not act continuously.

What can be done by the application of force without intermission is shown by the foot of the Chinese lady, which may be compressed into a space some three inches long.

Sitting there is far too much of. We have abolished the older method of reclining at meals in its favour. We sit at concerts, lectures, business, school, cricket, football—even war is not seldom directed from an

armchair. Instead of miles of exercise to communicate with a distant friend, we sit down to the telephone or in a Pullman car. The cinematograph, the post, the press, and the telegraph bring all our needs to our chair. Man has found that less energy is required to sit than to stand, and much less than to go about. Medical knowledge informs him that the heart beats several times fewer in the sitting than in the erect position. Possibly the nation then is resting its heart !

We have increased the evil by our ingenious upholstery. The padding of seats is not now merely a form, their backs are designed for use. As a result, man has come to depend more and more upon his ligaments. A joint consists of the participating bones, and the ligaments of strong inelastic tissue which bind these together. But in addition, playing over every joint and contributing largely to the proper apposition of its bones, are the tendons of muscles. Inextensible as the ligaments are, if day after day, and year after year, the same forces are persistently brought to bear upon them, and none of the strain relieved by the tension of muscles, then inevitably they must yield. As a result of the slow weakening of special ligaments special 'sets' of the body are obtained. You may perceive it in the 'Eton slouch,' though this is in no way dissimilar from the usual shambling gait of the average citizen. When muscles are less and less called upon to do their share in maintaining position, these also must lose 'tone.' As evidently, when muscle is required to brace parts up to the full normal, it has first to take up the 'slack' so engendered before it can begin to make

effective effort—which is clearly against speed, economy of effort, and efficiency. Want of tone in the muscular system—which contains fully one-quarter of the blood of the body—must be reflected in the general health, so that sagging bodies will naturally account for anaemic and colourless minds.

The dependence upon the ligaments is marked whether a man stands with loosened knees or leaning against a wall or post, slouches with forward-drooping shoulders, or sits or lounges for half his time. The effects of perpetual sitting in women add to the general bad results by congestion of their pelvic organs, so that the typewriter girl, telephone operator, telegraph clerk—women in business anywhere, in fact—are physically deteriorated for the pains and pleasures of motherhood. The reasons are obvious. Sedentary occupations set up an enlargement of the veins of the pelvis, and particularly of the female organs of generation, and induce a catarrhal inflammation of singularly persistent and debilitating character leading to unhealthiness and possibly malpositions of the womb. No girl of thirteen or over should be allowed to spend more than two hours a day in continuous sitting.

It is too much to hope that the school of the future will allow the children in the lower departments to lie down or sprawl at intervals, though this is very necessary for their health and backs as well as for their limbs. At birth the backbone or spinal column from neck to lower loins shows only one long curve with concavity forward. Shortly a curve at each end in the opposite direction begins to appear. These are the cervical and lumbar curves, and the

completion of them gives that distinctive erectness to the human carriage. If a baby sits up too soon, its heavy head falling forwards will help to maintain the original single forward curve of its extremely flexible backbone, and the result is that spinal deformity known as kyphosis. Any too early or persistent strain on the soft spine of childhood will tend to produce deformity, and the curve of the deformity will naturally vary with the special malposition.

Put a child of even five years at an infant school desk ; teach it to lay its left arm on the desk while it uses its right hand in making pot-hooks ; keep this up for a year or two, and if there were no deviation in the size of the chest, the height of the shoulders, the sight, and the power of the hand on the two sides, this would be extraordinary. As an interesting development from the greater use of the right hand may be noted the hegemony which is possessed by the left side of the brain, for there is situated the all-important centre of speech. The left half of the brain governs the right side of the body and vice versa : the left position for the centre of speech is due to there being need of the closest connection between it and the most active working half of the brain and body. If you have apoplexy of the left brain, you will probably lose your speech if you are right-handed. Left-handed people speak with the right side of their brain. Ambidexterity has been suggested as a possible mode of overcoming the risks of a one-sided brain.

In those individuals who are right-handed there is a definite curvature of the spine towards that side, associated with the more powerful action of the

muscles of the right shoulder, arm, etc. Even the general asymmetry of the nose is a possible effect of a lifelong use of the handkerchief from one side only.

It is possible that constipation in children is greatly aided by their prolonged sitting in school. Children should change their position frequently, and if the stools or seats are made single, and these and the desks of the proper height, standing can be taken advantage of to exercise the lower limbs. But as already said, any child till, say, the age of ten should, in the ideal condition, be able to sit, stand, or sprawl at intervals as much in school as out of it. In the best offices the desks for the clerks are at such a height that standing can readily be indulged in as alternative to the universal sitting.

There is no justification whatever for 'drilling.' Play for the same period would be much more valuable. A healthy man or a healthy child, who has never seen a soldier or a drill-instructor, will walk upright, and with an infinitely preferable carriage to that of the professional soldier. Let the children play. They are neither little men, little women, nor little soldiers. In lieu of no exercise whatever, choose drilling, but if there is any other choice take it. Musical drill, however, unquestionably pleases the children and gives them a pleasant change.

But clerks and children are not the only sufferers from monotony of position or action. 'Writer's cramp,' induced by the continual use of one set of muscles, is one of the best known of the disabilities induced by faulty position. Those who write from the wrist are most likely to suffer from it, and wrist

writing is naturally what we are taught. Appearances may be disregarded with advantage in such a matter, and, though writing from the forearm with the whole hand moving may not look as neat or businesslike, it has its compensations. The bulk of modern writing may now, of course, be done by typewriters, but such writing as that required of cashiers can, so far, only be done by the pen, and there is no more cramping penmanship than this. Daily massage of the muscles concerned is a useful preventive, and one to be early adopted. The cramp itself is a spasm of the muscles and nerves suffering from the 'irritability of weakness,' in which muscular contractions, instead of acting at definitely separated intervals, fuse into one long contraction or cramp. Pianists are occasionally similarly afflicted, and this is hardly to be wondered at if it be realized that a Paderewski is capable of thirty consecutive finger movements, representing many more muscular contractions, per second : it requires a first-rate ordinary pianist to perform the same movements eighteen times in a second. Professional cigarette-rollers are liable to a similar infirmity.

Little need be said on the point of how awkwardness of position conduces not merely to inefficiency in the special action concerned but also to fatigue. We commend good position by the names 'style,' 'form,' 'grace,' 'poise.' Nature has seen to it that in position the easiest way is again the best. There is much in a good style, whether in batting, boxing, or walking, since such possession indicates a harmony with a deep-laid parsimony of nature. The wrist of a Ranjitsinjhi is as effective—and infinitely

pleasanter to watch—as the mighty ‘slog’ of a Hirst.

The carriage of the head and body which is so admired in those Eastern maidens who are accustomed to bearing their laden pitcher from the well balanced upon their heads, depends upon just such an appreciation of the benefits attainable by a wise combination of the mechanical action of the weight, directed by a combination of muscular and gravitational forces: it is undoubtedly the method most saving of energy and is accompanied by those appeals to our consciousness which we have labelled æsthetic.

This question of beauty reminds one that the natural pose of woman is that which suggests receptivity, and is not that absolute erectness, much less the brazen convexity, which an alteration in the shape of the pelvis caused by modern athleticism will undoubtedly produce. The natural attitude of the erect female figure when depending upon only muscle tone is that which suggests a slightly retiring curve.

Perfect poise and balance of all the parts of the body indicates an equal readiness and ability of all the muscles to contract, and while, for purposes of work or play, certain positions of certain muscular groups are found to possess advantages for the special function in view, it must not be forgotten that the power of complete inhibition of all contraction is a useful asset. The miraculous escapes of children who fall downstairs, or out of high perambulators, affords evidence of the usefulness upon occasion of muscular relaxation. The notorious comparative immunity of drunkards from death by accidents is ascribable to a similar volitionless flaccidity. And thus may be

learned the useful lesson of leaving the body to take care of itself during falls. The rugby player learns it.

Such deformities as knock-knees, bow-legs, and their kindred scarcely belong to this subject, since, though they may undoubtedly be caused by attempts to assume too early the positions of walking and standing in some cases, they are complicated by the existence of rickets in the majority of instances.

Position is the muscular reflection of a central nervous condition, and the preferences for special positions connotes a habit in nerve cells. The fewer the stereotyped positions that are formed, the more amenable is the body to fresh groupings and coordinations of its muscles, and the more flexible and responsive will be the whole body to any new demands that may be made upon its various motilities.

## CHAPTER XV

### HABIT

AT first mere paths in desert, jungle, or mountain, or the single furrows of isolated keels on lake, river, or sea have been all that connected tribe to tribe, village to village, and people to people. But as human portage gave way before the ampler loads of animals, and as tracks became paths and roads and highways, and the 'swan paths' of Norsemen and Viking grew to vessel and trade routes, the lines of worldly intercommunication hardened, defined, and became permanent, till to-day there is not a spot on earth, not excepting the Poles, towards which a journey must not at first proceed on clearly laid lines.

The brain which could evolve the immortality of 'trailing clouds of glory' was only made possible by the fixing of nervous routes, which began first of all with the vaguest of responses to stimuli. No impulse or stimulus can reach the body but its path is already mapped out for it among the lower nervous centres.

When the first amœba, with helplessly outflowing processes, first retracted one of them from the particle that threatened death, it acquired tactile, and this, with other æonic developments, has furnished us with brain and all the possibilities of soul, intellect, and habit.

We can trace the development from the flowing of

the whole body plasm of the amœba to an organism made up of many cells, of which some are specially designed for nervous and muscular work, as in the Cœlenterata ; thence to the Hydra with separate, nervous cells ; and sea-anemones with superficial sensory cells connected with underlying nerve cells, from which fibres pass to contractile elements. This is a chronological chain of which every stage may be observed in the world even now. In higher animals the superficial sensitive cells evolve till they become the organs of sense ; the underlying nerve cells become the ganglia and the central nervous system ; the contractile elements become muscles, while the interconnecting fibres have grown into nerves.

The brain of man is the direct descendant of the primal sensitive superficial cell : it is directly related with his skin, and there is a stage in the development of the human embryo when the cells which are the antecedent of the brain may be seen separating from the foetal skin. All life, mind and soul arise from impulses sent from the surface to organs which are derived from the surface.

The test of all morality and ethics is, in the last analysis, conduct, and the basis of conduct is movement, which itself depends upon a neuro-muscular equipment. Evidently the foundation on which 'conduct' rests is the 'reflex arc,' which is the simplest possible of nerve and muscle combinations. A pure 'reflex arc' consists of a sensitive cell, a fibre communicating with an inner nervous cell, and a fibre thence to a muscle cell. Tickle the sole of a baby's foot and the leg will be drawn up ; that is a pure reflex act. Through the enormous elaboration of human processes

it is scarcely possible to find in the body a perfect example of a primary form of this unit. The nearest approach to it is complicated always by several relays of cells and fibres. Even in winking, which is the quickest human reflex known—occurring in twentieths of a second—there are many sensitive cells fibres, motor fibres, and muscular strands involved.

Wundt tells us winking was originally volitional and then became stereotyped in the 'memory' of the cells as a result of their frequent use; that this frequency of employment began a 'habit,' and that from this to the elimination of consciousness, to the formation of a 'reflex,' was an easy step. We are further asked to believe that all reflexes have originated in this fashion.

The beginner at billiards is hampered by the length of his cue: he strikes extraordinary attitudes in order to get his eye as near the level of the table as possible; he finds his elbow in the way; has difficulty in making an efficient 'bridge'; probably finds that he is overbalanced by an awkward position of legs and feet; and finally, with the tip of the cue only an inch or so from the ball, may actually miss it altogether by the clumsiness of his stroke. Yet the same man will a few months later screw a difficult shot into a pocket as a result of habits which have become automatic, though the chances are that if he be asked to tell precisely the different mechanisms he has so easily co-ordinated he will omit three-quarters of them. The same process may be noticed in the pianist or typist who can execute a complicated series of digital movements and at the same time talk of totally different matters.

Habit, then, is 'the memory of the body,' and is of excellent service in saving conscious memory. In view of the extraordinary ability of the cells to 'remember,' it must be seen to that these memories, where they are controllable, shall be of the kind best calculated to help man's progress towards the stars: 'Our acts our angels are, or good or ill.' Over habits then, and their offspring reflexes, there is need for careful supervision.

Reflexes are concerned with the life of the organism as a whole: this is why they make no appeal to consciousness, for no conscious movement can be perfectly and continuously rhythmical, as is the beat of the heart, the movement of the lungs, the secretions of the body juices concerned with digestion, or the regular movements of the stomach. These are mechanisms which do not require to be taught their business, and which fortunately we can influence only indirectly. They with their organs form what is most deeply 'natural' within us, and may safely be left to do what is best for us if we do what is best for ourselves. The value of any habit likely to be acquired must be carefully examined. For 'a slave to habit' is a mere phrase. It indicates an actual change in the structure of the brain, which after a certain time, and particularly after a certain age, can hardly be removed, since it is dependent upon permanent alterations in nervous tissues.

The brain consists of over six hundred millions of cells of all sizes and shapes, each of these possessing innumerable branching filaments or fibres, by means of which it is brought into the closest possible connection with others, though actual contact is never

made. The intervening space, of the minutest possible dimensions, is filled by a homogeneous jelly of which we know nothing more than its properties. This it is that resists most vigorously the communication of cell with cell, or fibre with cell, or fibre with fibre : it is the part of the nervous system which is most susceptible to fatigue and every other harmful influence ; but when once a bridge has been made by the passage of an impulse over any part of it, the memory of this remains, or the actual structure of its material is so altered that all future passage is facilitated.

In the sparing of fatigue to the organism lies a prime justification of the value of habit, and in the possibility connected with it of the possibility reduplicating the force and scope of any habitual process. Compare one beat of the heart with another under the same circumstances : could such exactitude of strength and time be reduplicated by a conscious operation ? It will be found that, whenever it is necessary for man, woman, or child to make the same motion hundreds of times in succession, their precision will depend largely upon the extent to which volition is left out of the matter. Habit, once formed, means the capacity to reproduce exactly similar results with the minimum of fatigue.

I do not mean to limit the advantages of habit to merely muscular mechanisms ; what has been stated regarding these applies with equal force to every realm of mental and moral activity. The same materials are involved. Nerve cell, nerve fibre, and nerve synapse—these are the essentials.

Habits of thought have from their ease their

menace in the shape of limitation or narrowness ; while, as the natural converse, those who have built up none or few of such habits are likely to possess a livelier imagination, since the arriving energy is free to travel anywhere among the association fibres of the brain, and can thus combine a greater complex of visual, auditory, and other memories.

In this danger, then, of habits of action as well as thought being too liable to cause limitation lies an obvious offset to its advantages, and there is more in this point than only the ready accessibility of the well-trodden paths of thought or action. It is the case, when any such system is well established, that it tends to isolate itself, by making communication with other cerebral areas even more difficult than is accounted for by the natural resistance of the synapses. A greater effort, therefore, is necessary to break down the barriers of habit than is necessary to take the first step in acquiring a quite new one ; and of this the moral is clear : it is utilized in the treatment of those habits which have become so firmly rooted as to be obsessions. New habits are attempted which may eventually override the obsession of old habits.

Naturally the first practical application of the value of habit should be made in the case of children. The infant must acquire the habit of taking its meals of the proper quantity at the proper hours of day and night, but at this tender age this is almost all that can be done. The reflex action of the muscles which control the bladder and rectum will suffice to attend to these primary necessities of the young animal.

But when the child attains the age at which speech

begins to be understood, then must also begin that training of which the fullest adult life is the amplest reflection—the education in the habit of inhibition. This inhibition, meaning ‘ preventing ’ or ‘ willing not to,’ is, by a curious paradox, the supreme manifestation of the will.

Not for a moment is it declared that all natural impulses or reflexes must be always inhibited, but the power to say ‘ No ’ is the priceless heritage of man, and the judicious use of this power the criterion of his evolutionary status ; just as at a very early age it is needful for the child to be able to resist the inconvenient calls of nature, so the power of restraint thus begun will pervade its whole history.

Along with these trainings will naturally be acquired the habit of obedience. No demands on this score of docility should, however, be allowed to check the bodily activities of young children. Interference with the reflexes which prompt a child’s limbs and body to movements is bound to do harm, as is indeed any checking of the reflexes concerned with excretion —unless, for these, times are appointed at regular and desirable intervals. The waste of a child’s energy requires outlet as surely as do the waste products of its food and body.

With the age of speech begins the ability to manifest ‘ original sin,’ which is by no means a pure reflex, but a condition well within the cognisance of the child’s consciousness. It is a feature which without question partakes of the nature of instinct, inasmuch as it is made possible by early developed paths ; but, differently from the ages and states in which instincts are admissible, there are at this age

other areas of the brain quite capable of cultivation, and it must be the concern of the parents or friends to give these other more desirable regions their fair chance, for only so can the almost instinctive barbarities of youth be nullified.

It is not essential that even one of the instincts pure or mixed should survive, since the place of these is quite competently filled by the enormous variety of acquirements made possible to man by his powers of perception and consciousness. Instincts are only really serviceable to animals and the irrational man. It is probably best that instincts, along with the rest of the beast within us, should be allowed to lapse. Instinct has been too long overlaid in man for it to be essential to human life.

During the school period are initiated the habits of work and of a more restricted exercise, a training in acquirements which from the commencement should be based on what is known of the body, and with an eye to what is best for the future man. At this stage above all should be encouraged the habit of thought, which means the opening up and keeping open of the widest possible channels of brain-cell communication.

Habits, then, are of value for conserving energy in those processes where active thought would retard efficiency of performance; they are a danger when, from any combination of causes, they interfere with the power of fully utilizing all the faculties within us upon which a later evolution has set the seal of approval.



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